Draft Environmental Impact Statement
for the
Riley Ridge to Natrona Project

DOI-BLM-WY-D040-2014-0001-EIS
CASE FILE: WYW-167867
WYW-168290
WYW-185369
WYW-181373

BLM

High Desert District Office

MARCH 2018

Volume I of II

U.S. Department of the Interior
Bureau of Land Management

Draft Environmental Impact Statement for the Riley Ridge to Natrona Project

DOI-BLM-WY-D040-2014-0001-EIS
Case Files: WYW-167867
WYW-168290
WYW-185369
WYW-181373

Volume I

BLM High Desert District
280 Highway 190 North
Rock Springs, Wyoming 82901

Cooperating Agencies

Federal
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
National Park Service

County
Fremont County
Lincoln County Commissioners
Sublette County
Sweetwater County
Natrona County

Conservation Districts
Natrona County Conservation District
Popo Agie Conservation District
Sublette County Conservation District
Sweetwater County Conservation District

State of Wyoming Office of the Governor
Administration
Department of Agriculture Natural Resources and Policy Division
Department of Revenue
Department of Transportation
Game and Fish Department
Geological Survey
Governor's Policy Office
Industrial Siting Division
Land Quality Division
Office of State Lands and Investments
State Historic Preservation Office
State Parks, Historic Sites, and Trails
Travel and Tourism
Water Quality Division

March 2018

BLM Mission

To sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

Draft Environmental Impact Statement for the
Riley Ridge to Natrona Project

Lead Agency:	U.S. Department of the Interior Bureau of Land Management High Desert District
Cooperating Agencies:	U.S. Army Corps of Engineers U.S. Fish and Wildlife Service National Park Service State of Wyoming Office of the Governor Administration Department of Agriculture Natural Resources and Policy Division Department of Revenue Department of Transportation Game and Fish Department Geological Survey Governor's Policy Office Industrial Siting Division Land Quality Division Office of State Lands and Investments State Historic Preservation Office State Parks, Historic Sites, and Trails Travel and Tourism Water Quality Division Fremont County Lincoln County Commissioners Sublette County Sweetwater County Natrona County Natrona County Conservation District Popo Agie Conservation District Sublette County Conservation District Sweetwater County Conservation District
Type of Action:	Two right-of-way grants under the Mineral Leasing Act of 1920, as amended; three right-of-way grants under the Federal Lands Policy and Management Act of 1976
Project Location:	Fremont, Sublette, Sweetwater and Natrona counties, Wyoming
For further information on this document, contact:	Bureau of Land Management High Desert District Attn: Mark Mackiewicz 280 Highway 191 North Rock Springs, WY 82901 (435) 636-3616
Or email:	**BLM_WY_RRNP@blm.gov**
Access information about the project:	**http://bit.ly/2aW727l**
Availability period:	45 days after the publication of the Notice of Availability by the EPA in the *Federal Register*

Abstract

Pursuant to Section 102(2)(C) of the National Environmental Policy Act of 1969 and the Mineral Leasing Act of 1920, the Bureau of Land Management (BLM) High Desert District has prepared a Draft Environmental Impact Statement (EIS) to analyze and disclose the impacts of granting two rights-of-way across federal land to Denbury Green Pipeline, Riley Ridge LLC (Denbury) and one right-of-way to PacifiCorp (doing business as Rocky Mountain Power) to construct, operate, maintain, and eventually decommission and reclaim the Riley Ridge to Natrona Project. This proposal consists of three separate right-of-way applications: (1) the Riley Ridge Carbon Dioxide (CO_2) Pipeline and Riley Ridge Sweetening Plant (WYW-167867); (2) the Bairoil to Natrona CO_2 Pipeline (WYW-168290); and (3) a 230-kilovolt overhead transmission line (WYW-185369) to supply power to the Riley Ridge Sweetening Plant. The Draft EIS also analyzes and discloses the impacts of permitting two hydrogen sulfide (H_2S) injection wells (WYW-181373) associated with the Riley Ridge Sweetening Plant.

The Proposed Action, alternative pipeline routes, and an alternative of taking no action are considered in detail in the Draft EIS. Under the Proposed Action, the BLM would issue the grants to Denbury for rights-of-way across BLM-administered lands and permit drilling of two H_2S injection wells associated with the Riley Ridge Sweetening Plant. The BLM also would issue a grant to PacifiCorp for right-of-way across BLM-administered land for a 230-kilovolt overhead transmission line. Under the No Action Alternative, the BLM would deny the applications for rights-of-way from Denbury and PacifiCorp and the Riley Ridge to Natrona Project would not be constructed.

Table of Contents

Table of Contents

VOLUME I

List of Maps

List of Figures

List of Tables

APPENDICES

VOLUME II

List of Acronyms and Abbreviations

µg/m3	micrograms per cubic meter

A

AADT	Annual Average Daily Traffic levels
ACEC	Area of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
AIS	aquatic invasive species
AML	appropriate management level
ANS	aquatic nuisance species
AOI	Areas of Influence
APE	area of potential effect
API	American Petroleum Institute
Applicant	Riley Ridge LLC and PacifiCorp, doing business as Rocky Mountain Power
AQRVs	air quality related values
ARMPA	Approved resource management plan amendment
ATWS	additional temporary work space
AUM	animal unit month

B

BEA	U.S. Department of Commerce, Bureau of Economic Analysis
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BMP	best management practice
B.P.	before present

C

CAA	Clean Air Act
CCS	Center for Climate Strategies
CDC	Center for Disease Control and Prevention
CDNST	Continental Divide National Scenic Trail
CEQ	Council on Environmental Quality
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CH_4	methane
CIAA	cumulative impact analysis area

CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalent
CWA	Clean Water Act

D

dBA	decibel (A-weighted)
DDCT	Density Disturbance Calculation Tool
Denbury	Riley Ridge LLC
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior

E

EA	Environmental Assessment
EI	environmental inspector
EIS	Environmental Impact Statement
EOR	enhanced oil recovery
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ERMA	Extensive Recreation Management Area
ESA	Endangered Species Act of 1973

F

FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FLPMA	Federal Land Policy and Management Act of 1976
FTA	Federal Transit Administration

G

GAP	Gap Analysis Program
GHG	greenhouse gas
GHMA	General Habitat Management Area
GIS	geographic information system
GLO	General Land Office
gpd	gallons per day
gpm	gallons per minute
GWP	global warming potentials

H

H_2S	hydrogen sulfide
He	Helium
HAP	hazardous air pollutants
HDD	horizontal directional drilling
HFC	hydrofluorocarbons
HMA	Herd Management Area
HPTP	historic properties treatment plan
HUC	hydrologic unit code

I

IPCC	Intergovernmental Panel on Climate Change

K

KOP	key observation point(s)
kV	kilovolt

L

L/R	launcher/receiver

M

MBTA	Migratory Bird Treaty Act
$Mg/cm^2/day$	micrograms per square centimeter per day
MLA	Mineral Leasing Act of 1920
MLRA	Major Land Resource Area
MLV	mainline valve
MMcf/d	million cubic feet per day
MP	milepost
MPH	miles per hour
MV	map volume

N

N_2	nitrogen gas
NO_2	nitrogen dioxide
N_2O	nitrous oxides
NO_x	nitrogen oxides
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act of 1990

NAIP	National Agriculture Imagery Program
NEI	National Emission Inventory
NEPA	National Environmental Policy Act of 1969
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NHT	National Historic Trail
NOI	Notice of Intent
NPS	National Park Service
NPDES	National Pollutant Discharge Elimination Systems
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSO	No Surface Occupancy
NSPS	New Source Performance Standards
NSR	New Source Review
NST	National Scenic Trail
NTSA	National Trails System Act of 1968
NWI	National Wetlands Inventory

O

O_3	ozone
OHV	off-highway vehicle
OPS	Office of Pipeline Safety
OSHA	Occupational Safety and Hazard Administration

P

PFC	Proper Functioning Condition
PFYC	potential fossil yield classification
PHMA	Priority Habitat Management Area
PHMSA	Pipeline and Hazardous Materials Safety Administration
P.L.	public law
$PM_{2.5}$	particulate matter less than 2.5 micrometers in diameter
PM_{10}	particulate matter less than 10 micrometers in diameter
POD	plan of development
ppb	parts per billion
ppm	parts per million
Project	Riley Ridge to Natrona Project (also RRNP)
PRPA	Paleontological Resources Preservation Act
PSD	prevention of significant deterioration
psi	pounds per square inch

R

RCRA	Resource Conservation and Recovery Act

RFFA	reasonably foreseeable future action
RMP	Resource Management Plan
RMPA	Resource Management Plan Amendments
ROD	Record of Decision
ROS	recreation opportunity spectrum
RRNP	Riley Ridge to Natrona Project
RV	recreational vehicle

S

SEO	State Engineer's Office (Wyoming)
SF_6	sulfur hexafluoride
SFA	Sagebrush Focal Areas
SO_2	sulfur dioxide
SCADA	supervisory control and data acquisition
SFA	Sagebrush Focal Area
SHPO	State Historic Preservation Office
SLRU	sensitivity level rating unit (BLM)
SQRU	scenic quality rating unit (BLM)
SRMA	Special Recreation Management Area
SWCA	SWCA Environmental Consultants, Inc.
SWPPP	Stormwater Pollution Prevention Plan

T

TCP	traditional cultural properties
THPO	Tribal Historic Preservation Officer
TMDL	total maximum daily load
TNEB	thriving natural ecological balance
TOC	top of cement
TVD	true vertical depth

U

UGRB	Upper Green River Basin
UIC	underground injection control
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USDOT	U.S. Department of Transportation
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

V

VDZ	visual distance zones
VOC	volatile organic compound
VRI	Visual Resource Inventory (BLM)
VRM	Visual Resource Management (BLM)

W

WAAQS	Wyoming Ambient Air Quality Standards
WAQSR	Wyoming Air Quality Standards and Regulations
WDEQ	Wyoming Department of Environmental Quality
WDEQ-AQD	Wyoming Department of Environmental Quality, Air Quality Division
WEG	Wind Erodibility Group
WEI	Wind Erodibility Index
WGFD	Wyoming Game and Fish Department
WOGCC	Wyoming Oil and Gas Conservation Commission
WPA	Wyoming Pipeline Authority
WRCC	Western Regional Climate Center
WSA	Wilderness Study Area
WSGS	Wyoming State Geological Survey
WWDO	Wyoming Water Development Office
WYCRO	Wyoming Cultural Records Office
WYDOT	Wyoming Department of Transportation
WYNDD	Wyoming Natural Diversity Database
WYPDES	Wyoming Pollutant Discharge Elimination System

Executive Summary

EXECUTIVE SUMMARY

Introduction

This document, the Environmental Impact Statement (EIS), is being prepared in response to three applications for right-of-way grants submitted by Riley Ridge LLC (Denbury) and PacifiCorp, doing business as Rocky Mountain Power (collectively referred to as the Applicant), to the Bureau of Land Management (BLM) for the Riley Ridge to Natrona Project (RRNP or Project). Denbury, the Applicant, submitted an *Application for Transportation and Utility Systems and Facilities on Federal Lands* (Standard Form 299) to the BLM for two underground pipeline projects: (1) the Riley Ridge Carbon Dioxide (CO_2) Pipeline Project (WYW-167867) and (2) the Bairoil to Natrona CO_2 Pipeline Project (WYW-168290). In addition, Denbury submitted a proposal for two hydrogen sulfide (H_2S) injection wells (WYW-181373) to be sited near the proposed Riley Ridge Sweetening Plant, which is included in the Riley Ridge CO_2 Pipeline Project application. PacifiCorp submitted an application for right-of-way for a 230-kilovolt (kV) transmission line (WYW-185369) to supply power to the proposed Riley Ridge Sweetening Plant. The applications for right-of-way grants for Denbury's Proposed Action were submitted to the BLM on February 19, 2013, (Denbury) and January 25, 2016 (PacifiCorp); and the proposal for the injection wells was submitted to the BLM on September 12, 2013.

The Proposed Action includes the following Project components:

- An underground non-gaseous H_2S/CO_2 pipeline from the existing Riley Ridge Treating Plant (a methane [CH_4] and helium recovery facility) to the proposed Riley Ridge Sweetening Plant, consisting of 31 miles of 16-inch-diameter pipe in Sublette County;
- A CO_2 underground pipeline from the proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect, consisting of 129 miles of 24-inch-diameter pipe, and continuing from the interconnect another 84 miles to the terminus at the Natrona Hub in Natrona County;
- The 4.3-acre proposed Riley Ridge Sweetening Plant, located on BLM-administered lands, would be constructed and operated to separate the CO_2 from the H_2S; the H_2S would be reinjected into deep geologic formations via two proposed injection wells;
- An approximately 1-mile-long 230kV overhead transmission line that would bring power to the Riley Ridge Sweetening Plant from an existing 230kV transmission line; and
- Ancillary facilities, such as roads, valves, flowlines, etc.

After reviewing the scope of the Project, the BLM, as the lead federal agency, determined the Proposed Action is a major federal action and would require preparation of an EIS in compliance with requirements of the National Environmental Policy Act of 1969 (NEPA), as amended (United States Code [U.S.C.], Title 42, Chapter 55, Section 4321 et seq.) and Council on Environmental Quality regulations for implementing NEPA (Code of Federal Regulations [CFR], Title 40, Parts 1500-1508).

The BLM published a Notice of Intent (NOI) to prepare the EIS in the *Federal Register* on June 9, 2014. Thirteen agencies are participating as cooperating agencies in preparation of the EIS, including the U.S. Fish and Wildlife Service (USFWS), the National Park Service (NPS), and the U.S. Army Corps of Engineers (USACE); the State of Wyoming (and associated departments); Fremont, Lincoln, Sublette, Sweetwater, and Natrona counties, Wyoming; and four conservation districts, Natrona County, Popo Agie, Sublette County, and Sweetwater County in Wyoming.

Bureau of Land Management's Purpose and Need for the Federal Action

The need for this federal action is to respond to the Applicant's right-of-way applications for construction, operation, and maintenance of the Project across federal land submitted and being processed under the Mineral Leasing Act of 1920 (MLA) (30 U.S.C. 185) and the Federal Land Policy and Management Act of 1976 (FLPMA) (43 U.S.C. 1761); and to prepare an EIS in compliance with requirements of the NEPA, as amended. The need also is established under the BLM's responsibilities under various statutes, regulations, and policies as described in Section 1.6.2.3. The BLM's purpose is to respond to the Applicant's right-of-way applications for construction, operation, and maintenance of the Project and associated facilities on federal land for the use and disposal of CO_2 and H_2S.

The two right-of-way applications for the Project, including the Riley Ridge Sweetening Plant and injection wells (Denbury) are being filed under the MLA (30 U.S.C. 185) for access across federal lands. This act authorizes and governs leasing of public lands for developing deposits of coal, phosphates, oil, gas, and other hydrocarbons and sodium. It also authorizes the Secretary of the Interior or appropriate agency head to grant rights-of-way for pipelines through federal lands, including BLM-administered lands, for transportation of oil, natural gas, synthetic liquid or gaseous fuels.

The right-of-way application for the 230kV overhead transmission line (PacifiCorp) is being processed under the FLPMA, which provides the BLM with discretionary authority to grant use (i.e., right-of-way) of land they administer, taking into consideration impacts on natural and cultural resources (including historical resources). In doing so, the BLM must endeavor "to minimize damage to scenic and esthetic values, fish and wildlife habitat and otherwise protect the environment" through avoidance or mitigation (FLPMA Title V).

Decision to Be Made

The decision to be made by the BLM is whether to grant the Applicant rights-of-way to construct, operate, and maintain the proposed facilities on land they administer and under what terms and conditions. In so doing, the BLM, as lead agency, in coordination with the cooperating agencies, analyzes, through the EIS, the Applicant's plan for and the potential environmental impacts of constructing, operating, and maintaining the Project. Based on the analysis presented in this EIS, the BLM will issue a Record of Decision (ROD) on whether to grant the requested rights-of-way on land administered by the BLM.

The BLM's decision must include whether to:

- Grant a 30-year right-of-way to the Applicant (Denbury) to construct and operate the underground pipeline systems and associated above-ground facilities (e.g., the Riley Ridge Sweetening Plant, meter stations, pigging facilities, and valves), including permanent access roads
- Grant a 30-year right-of-way to the Applicant (PacifiCorp) to construct and operate the 230kV transmission line
- Approve the two injection wells
- Approve temporary workspace areas associated with the construction of the underground pipeline, including the temporary construction right-of-way, temporary work areas, pipe storage yards, and contractor yards

- Approve the temporary use of access roads associated with the construction of the underground pipeline

If the BLM grants the rights-of-way, the routes selected for the pipeline system and the transmission line, the terms and conditions and the agency-required mitigation requirements would be included in the grant authorization and Plan of Development (POD). In addition, if the BLM approves the injection wells, the conditions of approval and the agency-required mitigation requirements will be included in the Surface Use Plan.

In accordance with 43 CFR Section 1610.0-5(b), actions that occur on federal lands administered by the BLM, including a decision to grant a right-of-way under the MLA or the FLPMA, are guided by decisions specified in the existing BLM Resource Management Plan (RMP).

Applicant's Interests and Objectives

The Project would connect to Denbury's existing Greencore Pipeline to provide additional CO_2 for delivery to the Bell Creek Field and other fields that will utilize the CO_2 for enhanced oil recovery (EOR) in southeastern Montana.

Non-gaseous phased CO_2 is injected into subsurface oil-bearing formations to enhance oil production from existing and depleted oil wells to stimulate oil production. CO_2 is a common, ordinary compound usually thought of as a gas, although it is quite easily converted to a solid or liquid.

As an oil field ages, the natural oil reservoir pressure declines; thus, pumping becomes less efficient. To recover some of the remaining oil, it becomes necessary to employ enhanced methods of oil recovery, such as water flooding. Water flooding consists of injecting water into wells and forcing it into the oil reservoir. As the water spreads out from the injection site, it pushes some of the remaining oil toward producing wells. Water flooding is relatively inexpensive to employ, is effective in displacing oil and increasing the pressure in the reservoir, and can increase oil recovery from approximately 15 to 25 percent. Even after these secondary methods have been completed, as much as 60 percent or more of the original oil reserves are left in the ground. At this point, other tertiary or enhanced recovery methods become necessary to liberate some of the remaining reserves. Injection of CO_2 to increase oil recovery was first patented in 1952. Large-scale commercial CO_2 flooding occurs in Utah, Texas, Mississippi, Colorado, New Mexico, Oklahoma, Louisiana, and Wyoming. The first commercial application of CO_2 flooding in Wyoming was Amoco's Bairoil Project, which began injection of CO_2 in October 1986 (BLM 1989).

Carbon dioxide works to increase the volume of recoverable oil in several ways. In most reservoirs, CO_2 is easily miscible with the oil and can be thoroughly mixed at relatively low pressures. Once mixed, CO_2 is highly soluble. As it dissolves, it swells the oil, yielding a 10 to 30 percent increase in volume (Miller and Jones 1981). This swelling forces more oil out of the reservoir pores, making it available for recovery. In addition, CO_2 decreases the viscosity of oil, allowing it to flow more freely. Carbon dioxide also aids recovery by the solution gas drive. Just as CO_2 goes into solution with an increase in reservoir pressure, gas will come out of solution and continue to drive oil into the wellbore. Finally, the slightly acidic nature of the CO_2 water mixture promotes certain injectivity changes. Clays are stabilized due to a reduction in pH, and injectivity is improved in carbonates by increased permeability. The CO_2 flooding technique is similar to water flooding except that the CO_2 gas acts as a solvent to reduce the viscosity of oil, rendering it more mobile, while maintaining pressure in the reservoir.

The two acid gas H_2S injection wells would be located at the Riley Ridge Sweetening Plant. Once the CO_2 is separated from the H_2S, the H_2S would be injected into a deep geologic formation for temporary

storage (refer to Section 2.2.1 and Appendix B of the Applicant's preliminary POD [note: the preliminary POD is included as Appendix A of this EIS]).

The Greencore Pipeline was completed in 2012 and transports non-gaseous phase CO_2 to the Bell Creek Field in southeastern Montana, where it is injected for producing oil in EOR operations at the Bell Creek Field. Ultimately, the current proposed RRNP would provide a connection between the existing Riley Ridge Gas Plant and the Bell Creek Field. It is estimated that the CO_2 injected via the Project would increase oil production of existing wells by as much as five-fold. Consequently, the Project would access known reserves and supply domestic energy supplies.

Conformance with BLM Management Plans and Other Laws and Policy Considerations

BLM-administered lands are administered with direction provided in land-use plans that establish the goals and objectives for the management of the resources and land uses. BLM RMPs must be prepared in accordance with FLPMA and regulations at 43 CFR 1600. The Project area includes land administered by:

- Record of Decision and Approved Casper Resource Management Plan. December 2007 (amended 2009, 2010, 2011, and 2012)
- Record of Decision and Approved Resource Management Plan for the Lander Field Office Planning Area. June 2014
- Record of Decision and Approved Pinedale Resource Management Plan. November 2008
- Record of Decision and Approved Rawlins Resource Management Plan. December 2008 (amended 2012, 2013, and 2014)
- Record of Decision and Approved Resource Management Plan Amendments (ARMPA) for the Rocky Mountain Regions, Including the Greater Sage-Grouse Sub-Regions of Lewistown, North Dakota, Northwest Colorado, Wyoming and the Approved Resource Management Plans for Billings, Buffalo, Cody, HiLine, Miles City, Pompeys Pillar National Monument, South Dakota, Worland. September 2015
- Record of Decision and Green River Resource Management Plan. October 1997 (RMP revision planned for 2nd Quarter of 2018)

Also, BLM Manual 6280, Management of National Scenic and Historic Trails and Trails under Study or Recommended as Suitable for Congressional Designation, provides the line management and program staff with policies for the management of National Scenic and Historic Trails.

The BLM reviewed the land-use plans for the State of Wyoming as well as the Sublette, Sweetwater, Fremont, and Natrona counties and considered the land-management objectives and policies established in the plans.

The State of Wyoming does not have a comprehensive plan for the Project area. The Wyoming Office of State Lands and Investments manages Wyoming Trust Lands.

The Wyoming State Land Trust consists of three assets: state trust land, state trust minerals, and state permanent land fund. All three assets derive from those lands granted by the federal government to the State of Wyoming at the time of statehood under various acts of the U.S. Congress and accepted and governed under Article 18 of the Wyoming Constitution. The revenues generated by trust land and minerals are reserved for the exclusive benefit of the beneficiaries designated in the congressional acts.

The beneficiaries are the common (public) schools and certain other designated public institutions in Wyoming, such as the Wyoming State Hospital (Wyoming Office of State Lands and Investments 2013).

The *Sublette County Comprehensive Plan* (Sublette County 2003), as amended in 2005, identifies goals and policies to promote open communication and active participation of the county with federal and state agencies in land-use planning and decision-making. Goals and policies include balancing economic development with conservation of natural resources; protecting sensitive environmental resources; ensuring consideration of county interests in federal and state planning and decision-making; and encouraging multiple-use land management that complies with federal and state regulations, is consistent with the county plan, and is mutually beneficial for each entity. County policies indicate their request to participate "at the earliest opportunity, in any public land/resource issue affecting the ecological, economic, cultural, or social wellbeing of Sublette County citizens; even to the point of acquiring cooperating agency status."

The *Sublette County Federal & State Land Use Policy* (Sublette County 2009) supports a high-level of collaboration and cooperation between agencies when engaging in land-use planning activities. The purpose of this plan is to identify "recommendations and policies for land management and use on federal and state lands within the county." Principles identified in the policy encourage federal and state land management that promotes the health, safety, environment, and well-being of the county's citizens, while stimulating the economy and being sensitive to local and state governments. Principal intents of this policy are to "protect the integrity of environmental systems and natural resources; preserve resource-based industries; promote a robust, diverse and stable economy; minimize conflicts between land uses; protect public health, safety and welfare; promote an understanding of the dynamics and benefits to and from agriculture and other multiple-use activities and federal land concerning wildlife; preserve culture, customs, heritage, and economic diversity; and recognize and protect private rights and interests in federal and state land resources including rights-of-way and public access, grazing permits, water rights, special-use permits, leases, contracts, and recreation use permits and licenses."

The *Sublette County Conservation District Long Range Plan 2014-2019* (Sublette County Conservation District 2014) supports collaboration with federal land-management agencies "in development of and coordination of land management plans." The objectives of the long-range plan are to (1) "actively seek and participate in planning processes as a coordinating agency," and (2) "represent and advance the policies stated within the District's Public Land Use Policy booklet, developed through public processes and filed with the Sublette County Clerk."

The *Sweetwater County Comprehensive Plan* (Sweetwater County 2002) supports participation in federal and state land-use planning activities and encourages communication among agencies. The objective of the county plan is to "promote agency awareness of county issues and interest. These include, but are not limited to, natural resource exploration and development, multiple-use land and resource-management practices, agriculture/ranching, and recreation, and adequate public access to and across public lands." Goals of the comprehensive plan include (1) encourage/support interaction between local, state, and federal agencies and private landowners; (2) encourage and support environmentally responsible resource development; (3) encourage a balance between resource development and environmental protection; (4) recognize and protect the county's unique cultural, recreational, environmental, and historical resources; (5) encourage the location of associated worker housing within existing communities where services are/can be provided; (6) support the county's traditional land uses and interests; (7) promote local (private) concerns and interests as an integral part of public land-management decisions; and (8) encourage the proactive, coordinated planning and delivery of public utilities and infrastructure services.

The *Sweetwater County Conservation District Land and Resource Use Plan and Policy* (Sweetwater County 2011) was developed to translate the Conservation District's "statutory mandate into land

management policy direction" and is the guide for federal, state, and local decision-makers in educating and addressing natural resources management concerns that would include "water quality and quantity, grazing management, wildlife conservation, tree establishment, land-use planning, public education efforts, and conservation…."

The *Fremont County Land Use Plan* (Fremont County 2004) indicates, "The goal of this plan is to assert the rights granted under the laws of the United States of America and the State of Wyoming, to a voice in the planning and regulation of the federally or State managed lands within the borders of Fremont County Wyoming. The high percentage of federally or State managed land in this county has led to a dependency on the rights of use of this land to the economic base and culture of this area. The goal of the Fremont County Land Use Plan is to secure the right of use of the federally or State managed land on no more restricted level than is spelled out by the accompanying plan components for Water, Timber, Grazing, Mining and Minerals, Endangered Species, Recreation, and Transportation, and others." The stated objectives are to, "strive for current or higher levels of use and development of federally or State managed lands and natural resources to occur alongside common-sense conservation for future generations. To require credible science to be employed in any decisions made regarding lands and resources in Fremont County."

Natrona County 2040 (Natrona County 2014) serves as a reference document and helps guide the development department and governing bodies when considering all of Natrona County's land-use planning. This plan is an update to the 1998 Development Plan. The Natrona County 2040 plan reflects recent and projected growth-related changes in the county and helps guide the Natrona County Planning Department and governing bodies when considering land-use planning decisions.

The *Wyoming's Action Plan for Energy, Environment and Economy* (Wyoming Office of the Governor 2013) serves as a framework to create an efficient problem-solving tool to balance energy regulation, land management, and planning.

Proposed Action and Alternatives

No Action Alternative

Under the No Action Alternative, the BLM would reject the Project as proposed and would not issue the right-of-way grants or permits for drilling the injection wells. Without rights-of-way across federal lands or permits to drill the injection wells, the Project could not be constructed due to the federal land ownership patterns in the region. There would be no identifiable impacts on the environmental resources on federal, state, and private lands.

If the Project were not approved, Denbury or other pipeline proponents may propose projects in the future. Given the market value of the volumes of CO_2 being produced in the region, Denbury or other companies could submit new right-of-way grant applications to the BLM for different pipeline routes. This would initiate a new and separate NEPA process.

Alternative Pipeline Routes

Several alternative pipeline routes were developed for detailed study in the EIS. Alternative route development occurred through two stages: (1) Applicant (Denbury) study of opportunities and resource constraints to identify a Proposed Action, submitted to the BLM in February 2013 as the Proposed Action in the application for right-of-way; (2) agency and public review of the Proposed Action and development of preliminary alternative routes. Section 368 energy corridors (set forth in Section 368 of the Energy Policy Act of 2005) were evaluated as a siting opportunity during alternatives development. In general, the Proposed Action follows existing linear utilities or designated utility corridors to the maximum extent

possible. Although not the most direct route, at the time of filing the application for right-of-way, the Applicant believed the Proposed Action avoided many cultural, biological, and engineering constraints posed by routes and was heavily influenced by input the Applicant received from BLM field offices during pre-application meetings held throughout 2012.

Modifications to the preliminary alternative routes were based on comments received from the public, the BLM, and cooperating agencies during the scoping process, which initiated the preparation of this EIS. That is, as a result of concerns and issues identified during scoping, the preliminary routes were refined to establish the network of alternative pipeline routes to be studied and analyzed in the EIS. The alternative routes are organized in three primary groupings:

- Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant
- Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect
- Segment 3: Bairoil Interconnect to the Lost Cabin Interconnect/Natrona Hub Interconnect

Segment 1: From the Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Alternative 1A: Proposed Action is 30.4 miles of 16-inch pipeline beginning at the existing Riley Ridge Treating Plant and extending southeast to the proposed Riley Ridge Sweetening Plant.

Alternative 1A Variation: Dry Basin Draw is a variation to the Proposed Action in the Pinedale Field Office and is approximately 3 miles in length. This variation deviates from the Proposed Action near State Highway 235. This route variation was developed to reduce the number of pipeline crossings through the existing B-Unit Wells production field.

Alternative 1B: Dry Piney is an alternative route to the Proposed Action in the Pinedale Office and is approximately 34 miles in length. This alternative route follows the alignment of the Proposed Action from the Riley Ridge Treatment Plant heading east and south until the route diverges from the alignment of the Proposed Action to follow State Highway 235 for about 5 miles and then cuts east to converge again with the Proposed Action near U.S. Route 189. This alternative route was developed to minimize potential impacts on sage-grouse and to avoid conflicts with activities in the existing B-Unit Wells production field.

Alternative 1C: Figure Four is an alternative route to the Proposed Action in the Pinedale and Rock Springs Field Offices and is approximately 38 miles in length. This alternative route follows the same alignment as Alternative 1B: Dry Piney but continues further south along State Highway 235 and then cuts east crossing U.S. Route 189 north of the Town of La Barge and connects to the Proposed Riley Ridge Sweetening Plant. This alternative route follows existing disturbance and is anticipated to minimize potential effects on wildlife more than other alternative routes being considered in this segment.

Segment 2: From the Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Alternative 2A: Proposed Action is approximately 129 miles of 24-inch pipeline, which would transport the CO_2 from the Riley Ridge Sweetening Plant eastward. The pipeline would travel east through southern Sublette County crossing into northern Sweetwater County. It would continue southeast across Bush Rim and into the Red Desert, and then turn northeast until it reaches the Bairoil Interconnect about 50 miles northwest of Rawlins, Wyoming.

Alternative 2B: Southern Route is an alternative route to the Proposed Action in the Rock Springs, Rawlins, and Lander Field Offices and is approximately 136 miles in length. This alternative route heads southeast from the Proposed Riley Ridge Sweetening Plant, crossing State Highway 28 and U.S. Route

191 south of Farson, Wyoming. This alternative route then heads northeast where it continues paralleling the Proposed Action to the Bairoil Interconnect. This alternative route was developed to create fewer crossings of National Historic Trails (NHT).

Segment 3: From the Bairoil Interconnect to the Lost Cabin Interconnect/Natrona Hub Interconnect

Alternative 3A: Proposed Action travels from the Bairoil Interconnect, the pipeline route travels northeast through Fremont County in a designated pipeline corridor, turn easts into Natrona County, and finally north for an additional 84 miles for connection to the Greencore CO_2 Pipeline at the Natrona Hub, which is approximately 30 miles west of Casper, Wyoming.

Alternative 3B: Lost Creek to Lost Cabin is an alternative route to the Proposed Action in the Lander Field Office and is approximately 73 miles in length. This alternative route heads northeast from the Bairoil Interconnect crossing U.S. Route 287 and parallels the Proposed Action until it crosses State Highway 136. The alternative route continues north near Moneta, Wyoming, and ties into the Lost Cabin Interconnect near Lost Cabin, Wyoming. This alternative route was developed to utilize a utility corridor designated in the Approved RMP for the Lander Field Office and to tie into the Greencore Pipeline at Lost Cabin versus the Natrona Hub.

Alternative 3C: Lost Creek to Highway 20/26 is an alternative route to the Proposed Action in the Lander and Casper Field Offices and is approximately 101 miles in length. This alternative route parallels Alternative 3B: Lost Creek to Lost Cabin until Moneta, Wyoming, where the alternative route diverges and heads east along Highway 20/26 and ties into the Natrona Hub near Powder River, Wyoming. This alternative route was developed to utilize a utility corridor designated in the Approved RMPs for the Lander and Casper Field Offices.

Agency Preferred Alternative

The Agency Preferred Alternative on federal lands is the alternative route the BLM, in coordination with the cooperating agencies, believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical, and other factors. The Department of the Interior regulations at 43 CFR 46.20(d) allow the responsible official to render a decision on a proposed action as long as it is within the range of alternative routes discussed in the relevant environmental document. The decision of the responsible official(s) may combine alternative routes discussed, in the relevant environmental document, if the effects of such combined elements of alternative routes are reasonably apparent from the analysis. The Agency Preferred Alternative for this Project is the combination of Alternative 1C: Figure Four, Alternative 2A: Proposed Action, and Alternative 3B: Lost Creek to Lost Cabin.

The Agency Preferred Alternative was identified by the BLM in coordination with cooperating agencies using criteria based on key resource concerns and issues, regulation and policy, and Council on Environmental Quality regulations for determining significance. The criteria used include the following:

- Maximizes use of existing designated utility corridors by locating within the corridors or paralleling existing linear utility rights-of-way.
- Avoids or minimizes impacts on resources that are regulated by law, after consideration of Project design features and agency best management practices. This includes impacts on greater sage-grouse.
- Avoids or minimizes impacts on resources that demonstrate potentially unavoidable adverse impacts after consideration of design features of the Proposed Action for environmental

protection and agency-required mitigation measures, even though those resources may not be regulated by law.

- Minimizes the need for plan amendments through conformance to land-use plans.
- Avoids or minimizes proximity to private residences and residential areas, thereby addressing concerns with public health and safety, aesthetics, visual effects, and others.
- Minimizes use of private lands, assuming natural resource impacts are more or less similar.

If multiple alternative routes meet the preceding criteria, the Agency Preferred Alternative would be the alternative route that minimizes technical constraints; construction, operation, and maintenance expense; and/or time.

In Segment 1, Alternative 1C: Figure Four is an alternative route to the Proposed Action route in the Pinedale and Rock Springs Field Offices and is approximately 38 miles in length. This alternative route follows the alignment of the Proposed Action from the Riley Ridge Treatment Plant heading east and south until the route diverges from the alignment of the Proposed Action to follow State Highway 235 and then cuts east crossing U.S. Route 189 north of the Town of La Barge and connects to the proposed Riley Ridge Sweetening Plant. This route follows existing disturbance and avoids the Special Recreation Management Area and Visual Resource Management Class II areas adjacent to the Green River in the Pinedale Field Office. Also, Alternative 1C: Figure Four would have fewer potential effects on greater sage-grouse than other alternative routes considered and analyzed in this segment.

In Segment 2, Alternative 2A: Proposed Action is approximately 129 miles long. The route begins at the Riley Ridge Sweetening Plant and travels eastward through southern Sublette County, crossing into northern Sweetwater County before continuing southeast across Bush Rim and into the Red Desert, and then turns northeast until it reaches the Bairoil Interconnect about 50 miles northwest of Rawlins, Wyoming. This alternative route avoids the Boar Tusk area and surrounding sacred landscape. Tribal input received from the Northern Arapahoe Tribe of the Wind River Reservation indicates the tribe is not in favor of Alternative 2B: Southern Route because of the proximity to Boars Tusk. In addition, the Shoshone-Bannock Tribes of the Fort Hall Reservation strongly recommended that no additional access to the Boars Tusk area should be indirectly induced by the Project decision. The cumulative disturbance in Priority Habitat Management Areas (PHMA) for Alternative 2B: Southern Route would be 2.4 percent. Both alternative routes would be under the 5 percent of the density disturbance calculation tool (DDCT) area allowable under the Wyoming ARMPA. The Applicant, BLM, and WGFD worked closely together to identify opportunities to avoid and minimize impacts on PHMAs. Residual effects would not inhibit achieving compliance with laws, regulations, and/or policies.

In Segment 3, Alternative 3B: Lost Creek to Lost Cabin is an alternative route to the Proposed Action route in the Lander Field Office and is approximately 73 miles in length. This alternative route heads northeast from the Bairoil Interconnect crossing U.S. Route 287 and parallels the Proposed Action route until it crosses State Highway 136. The alternative route continues north near Moneta, Wyoming, and ties into the Lost Cabin Interconnect near Lost Cabin, Wyoming. This route utilizes a utility corridor designated in the Approved RMP for the Lander Field Office and to tie into the Greencore Pipeline at Lost Cabin versus the Natrona Hub.

Applicant-Committed Design Features and Agency-Required Mitigation Measures

To avoid, minimize, and mitigate impacts on the human and natural environment, the Applicant has identified several design features of the Proposed Action for environmental protection that would be implemented for the RRNP. These Applicant-committed measures are part of the Project description and

are detailed in their preliminary POD submitted with the Applicant's applications for rights-of-way and Surface Use Plan for the two injection wells. The design features of the Proposed Action for environmental protection include best management practices, standard operating practices, or other procedures employed by the Applicant as standard conduct that contributes to avoiding, minimizing, reducing over time, or rectifying effects of the Project during construction, operation, and maintenance.

Specific design features applicable to pipeline projects from the Wyoming ARMPA for greater sage-grouse (BLM 2015) would be applied for greater sage-grouse in the Pinedale, Rock Springs, Rawlins, and Casper Field Offices However, greater sage-grouse in the Lander Field Office would be managed by the approved Lander RMP.

In addition, through this environmental review, the BLM and cooperating agencies have identified additional mitigation measures and other applicable stipulations for avoidance, minimization, and mitigation of the environmental impacts resulting from the implementation of the Project on a resource- or site-specific basis where residual impacts are anticipated. The agency-required mitigation measures identified in this EIS include measures stipulated for resource management in BLM RMPs and other land-use plans, as applicable.

Additional Mitigation

Following the assessment of the potential impacts that could remain after application of the avoidance, minimization, and rectification/restoration measures, the BLM determined a remaining residual impact on greater sage-grouse, temporary habitat loss, would inhibit achieving compliance with the Wyoming ARMPA and warrants additional appropriate mitigation. The rationale is described below.

For other resources, the BLM determined that the nature and extent of predicted residual effects identified through the NEPA process indicates the effects would be minor, localized, or temporary and, therefore, do not warrant additional mitigation. Also, the residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies.

Refer to Appendix C for additional detail on the potential impacts associated with the Project, a summary of mitigation measures for avoiding and minimizing Project effects, and the remaining residual adverse impacts.

Temporary Loss of Greater Sage-grouse Habitat

Permanent habitat loss would largely be avoided through reclamation (Agency-required Mitigation Measure 8) and minimizing habitat disturbance (Agency-required Mitigation Measures 3 and 10); however, reclamation take years, short-term removal of existing vegetation could contribute to temporary habitat loss.

The nature and extent of residual effects associated with disturbance from Project activities during construction (i.e., in the short term) that were identified through the NEPA process warrant additional appropriate mitigation to mitigate for temporary habitat loss. Additional mitigation is required to achieve the Wyoming ARMPA objectives.

In Segment 2, the Agency Preferred Alternative (Alternative 2A: Proposed Action) would result in 4.58 percent disturbance in PHMAs. The Applicant, the BLM, and the Wyoming Game and Fish Department worked closely together to identify opportunities to avoid and minimize impacts on PHMAs. Residual effects would not inhibit achieving compliance with laws, regulations, and/or policies.

Key Resources Considerations

From the inclusive list of issues identified in the scoping and public involvement, many issues are addressed by design features of the Proposed Action for environmental protection or agency-required mitigation and, through the effects analysis conducted for the Project, some issues were found not to be substantive. However, the effects analysis also indicates that the predicted effects would vary between the Proposed Action and the alternative route considered. Also, due to policy or management considerations, some resources developed, through the results of the effects analysis, to become either pivotal to Project development or principal drivers in the identification of the Agency Preferred Alternative. These resources and key issue areas include (1) National Conservation Lands, including NHTs and non-Wilderness Study Area lands with wilderness characteristics; (2) greater sage-grouse habitat; and (3) Native American concerns. Also, land jurisdiction (i.e., location on public versus private lands) and the extent to which the Proposed Action and alternative pipeline routes considered in the EIS are located within designated utility corridors or adjacent to existing linear utilities or other existing rights-of-way are important considerations (Table S-1).

Table S-1
Utility Corridors and Jurisdiction

Alternative Route	Length (miles)	Utility Corridors (miles)	Parallel Linear Facilities within 250 feet of Centerline (miles)				Jurisdiction (miles)		
			115-kilovolt	230-kilovolt	Unknown Voltage	Pipeline	Bureau of Land Management	State	Private
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant									
1A: Proposed Action	30.4	–	–	–	–	1.9	25.2	2.7	2.5
1A Variation: Dry Basin Draw	30.7	–	–	–	–	3.0	25.5	2.7	2.5
1B: Dry Piney	34.5	–	–	–	–	9.4	23.9	3.4	7.2
1C: Figure Four	38.5	–	–	–	–	15.5	31.9	3.5	3.1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect									
2A: Proposed Action	129.1	20.9	–	1.3	–	45.0	121.5	7.1	0.5
2B: Southern Route	136.2	20.9	–	1.3	–	69.2	123.8	2.7	9.7
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect									
3A: Proposed Action	83.2	61.7	0.3	0.6	0.3	49.6	40.3	6.7	36.2
3B: Lost Creek to Lost Cabin	73.0	72.7	0.2	0.3	–	54.6	51.0	4.4	17.6
3C: Lost Creek to Highway 20/26	101.4	101.5	0.2	0.3	0.2	51.4	50.1	8.7	42.6

National Conservation Lands

National Historic Trails

In Segment 1, no NHTs are crossed by the Proposed Action or alternative routes considered.

In Segment 2, Alternative 2A: Proposed Action would result in 12.0 miles of moderate residual impacts where the alternative route crosses the Oregon/California/Mormon Pioneer/Pony Express NHTs, the Sublette Cutoff of the California NHT, and the Continental Divide National Scenic Trail. In comparison,

Alternative 2B: Southern Route would result in 10.1 miles of moderate residual impacts where the alternative route crosses the Oregon/California/Mormon Pioneer/Pony Express NHTs, the Sublette Cutoff of the California NHT, and the Continental Divide National Scenic Trail.

In Segment 3, Alternative 3A: Proposed Action, Alternative 3B: Lost Creek to Lost Cabin, and Alternative 3C: Lost Creek to Highway 20/26 would result in 2.7 miles of moderate residual impacts where the alternative route crosses the Oregon/California/Mormon Pioneer/Pony Express NHTs.

Lands with Wilderness Characteristics

In Segment 2, Alternative 2A: Proposed Action would affect lands with wilderness characteristics; Alternative 2B: Southern Route would not. The 2A: Proposed Action would result in the removal of 131.7 acres from WY040-2011-059 but would not affect the long-term management of the remaining acreage. This unit has not yet been through the land-use planning process. However, the Rock Springs RMP is currently under revision and is anticipated to be completed in 2019.

No routes considered in Segments 1 and 3 would affect lands with wilderness characteristics.

Greater Sage-Grouse

In Segment 1, Alternative 1A: Proposed Action, the Alternative 1A Variation: Dry Basin Draw, and Alternative 1B: Dry Piney both cross No Surface occupancy (NSO) areas and would result in relatively the same amount of impacts on contiguous habitat block of general habitat management area. Although Alternative 1C: Figure Four crosses the most greater sage-grouse habitat, it would result in low residual impacts because it does not cross NSO areas. No PHMAs would be affected by any alternative routes in Segment 1.

In Segment 2, the 2A: Proposed Action would affect a slightly higher amount of PHMA than Alternative 2B: Southern Route. Estimated Project disturbance to PHMAs from Alternative 2A: Proposed Action is only slightly greater than the Alternative 2B: Southern Route but would result in substantially greater cumulative disturbance based on the DDCT, as a result of greater existing disturbances in the PHMA assessment area. Using the DDCT process outlined by the Wyoming Geographic Information Science Center, the cumulative disturbance in PHMAs for Alternative 2A: Proposed Action would be 4.58 percent, which meets the 5 percent of the DDCT area allowable under the Wyoming ARMPA. The cumulative disturbance in PHMAs for Alternative 2B: Southern Route would be 2.4 percent, also under the 5 percent of the DDCT area allowable under the Wyoming ARMPA.

In Segment 3, considering its longer length and assessment area, Alternative 3A: Proposed Action would result in the most disturbances to PHMAs. Alternative 3B: Lost Creek to Lost Cabin is the shortest route and would have the lowest impacts overall. Alternative 3A: Proposed Action would result in slightly less cumulative disturbance (3.4 percent) than Alternative 3C: Lost Creek to Highway 20/26 (3.6 percent) based on the DDCT, as a result of less existing disturbances in the PHMA assessment area. Cumulative disturbance in PHMAs would be the least for Alternative 3B: Lost Creek to Lost Cabin (2.3 percent), but in this segment all three routes would not exceed the 5 percent of the DDCT area allowable under the Wyoming ARMPA.

Native American Concerns

In Segment 1, some of the tribes expressed concern about Alternative 1A: Proposed Action due to the presence of the Chimney Butte landscape. This prominent landform is located in proximity to the alternative route (0.3 mile to the northeast). The Chimney Butte landscape is culturally important to several tribes, including the Crow Creek Sioux Tribe, the Cheyenne River Sioux Tribe, and the Rosebud Sioux Tribe. The tribes stated that tribal inventory of key landscapes such as Chimney Butte would take

into account the viewshed and sacredness of the feature. Alternative 1B: Dry Piney or Alternative 1C: Figure Four avoid the Chimney Butte landscape. The tribes did not express specific concerns about Alternatives 1B: Dry Piney or 1C: Figure Four. Based on the discussion during the field visit, there was no general consensus for Segment 1, since all the alternative routes were not visited. The Eastern Shoshone Tribe of the Wind River Reservation expressed concern about the pipeline crossing the Green River in Segment 1. The tribe is concerned about pipeline leakage or breakage and spills of CO_2 and H_2S gas into the river. It has been suggested that the pipeline be constructed above ground (especially at river crossings) as it would be more easily accessed, should problems arise. However, the tribe has noted that there would be visual impacts, the potential for vandalism, maintenance issues due to high winds, and greater ground disturbance if the pipeline crossing was above ground at the river crossing.

In Segment 2, the tribes did not express specific concerns about Alternative 2A: Proposed Action. Some of the tribes expressed serious concern about portions of Alternative 2B: Southern Route because of its proximity to the Boars Tusk area. Micro-siting may not be an appropriate action because the surrounding landscape is of importance to the tribes; however, the tribes would be consulted regarding micro-siting options. The Shoshone-Bannock Tribes of the Fort Hall Reservation have expressed specific concerns regarding public access and the impact of recreational use (e.g., climbing) on the Boars Tusk area. The tribes are concerned with increased public access in general in the Boars Tusk area. In addition, Alternative 2B: Southern Route is located in proximity to the Boars Tusk area in Visual Resource Management Class II lands within a slightly modified setting but due to separation from any existing utilities, the Project would require extensive mitigation measures, as described, to reduce effects. No routes considered in Segments 1 and 3 would affect the Boars Tusk area.

In Segment 3, sites associated with the Cedar Ridge Traditional Cultural Property (TCP) are located along Alternative 3A: Proposed Action. Some of the tribes expressed concern about portions of this alternative route, due to the presence of sites associated with the Cedar Ridge TCP. Additionally, the Cedar Ridge TCP and its periphery are in the vicinity of Alternative 3B: Lost Creek to Lost Cabin. The Cedar Ridge TCP is a sacred place for the Eastern Shoshone Tribe of the Wind River Reservation, the Northern Arapaho Tribe of the Wind River Reservation, the Crow Tribe, the Northern Cheyenne Tribe, and, possibly, other Native American tribes. Alternative 3B: Lost Creek to Lost Cabin is acceptable to the tribes if located within the Lost Creek Pipeline corridor and with micro-siting in some locations to avoid sites of Native American concern. The tribes expressed concern about portions of Alternative 3C: Lost Creek to Highway 20/26, due to the presence of known sites of tribal concern. Unidentified resources that could be important to the tribes may be present. Tribal input received from the Shoshone-Bannock Tribes of the Fort Hall Reservation indicates the tribes' preference for Alternative 3B: Lost Creek to Lost Cabin to avoid sites of tribal importance along Alternative 3C: Lost Creek to Highway 20/26. Alternative 3B: Lost Creek to Lost Cabin is preferable as long as significant sites and sensitive areas are avoided.

The tribes expect that the Applicant will work diligently to avoid sites important to the tribes for any route selected for construction.

Consultation and Coordination

An NOI to Prepare an Environmental Impact Statement for the Proposed Riley Ridge to Natrona Project, Wyoming, was published in the *Federal Register* on June 9, 2014, which initiated a formal scoping period. As noted in the NOI, the formal scoping period was initially intended to end on July 9, 2014; however, on June 27, 2014, the BLM announced that the formal scoping period would be extended until August 1, 2014.

Cooperating Agencies

In conformance with Council on Environmental Quality regulations implementing NEPA, the BLM invited 56 federal and state agencies, Native American tribes, and local governmental entities to participate as cooperating agencies in the preparation of this EIS (40 CFR 1501.6). On July 18, 2014, formal letters were sent inviting tribes and local, state, and federal agencies to participate as cooperating agencies in the preparation of the EIS. Of the 56 invited, 13 accepted the invitation and are participating. Following is a list of the agencies invited, and those participating are marked with an asterisk.

Federal

- U.S. Fish and Wildlife Service – Wyoming: Ecological Services*
- National Park Service – National Trails*
- U.S. Army Corps of Engineers*
- U.S. Environmental Protection Agency, Region 8 (EPR-N)
- U.S. Forest Service
- U.S. Department of Energy
    - Office of Compliance
    - Office of Legacy Management
    - Western Area Power Administration
- U.S. Department of Transportation – Pipeline and Hazardous Material Safety Administration

Tribes

- Cheyenne River Sioux Tribe
- Comanche Nation of Oklahoma
- Crow Creek Sioux Tribe
- Crow Tribe
- Eastern Shoshone Tribe of the Wind River Reservation
- Fort Peck Assiniboine and Sioux Tribes
- Northern Arapaho Tribe of the Wind River Reservation
- Northern Cheyenne Tribe
- Oglala Sioux Tribe
- Rosebud Sioux Tribe
- Shoshone-Bannock Tribes of the Fort Hall Reservation
- Sisseton-Wahpeton Oyate Tribes
- Standing Rock Sioux Tribe
- Ute Indian Tribe of the Uintah and Ouray Reservation
- Yankton Sioux Tribe

Wyoming State Agencies

- State Historic Preservation Office*
- State of Wyoming Office of the Governor*
    - State of Wyoming State Lands and Investments*
    - State of Wyoming Department of Environmental Quality – Water Quality Division*
    - State of Wyoming Department of Agriculture*
    - State of Wyoming Game and Fish Department*
    - State of Wyoming Department of Transportation

Local

- Fremont County, Wyoming*
- Lincoln County, Wyoming Commissioners*
- Sublette County, Wyoming*
- Sweetwater County, Wyoming*
- Natrona County, Wyoming *
- Natrona County Conservation District*
- Popo Agie Conservation District*
- Sublette County Conservation District*
- Sweetwater County Conservation District*
- Dubois-Crowheart Conservation District
- Lower Wind River Conservation District
- Medicine Bow Conservation District
- Saratoga-Encampment-Rawlins Conservation District
- Carbon County, Wyoming
- City of Green River, Wyoming
- City of Rock Springs, Wyoming
- City of Rawlins, Wyoming
- City of Riverton, Wyoming
- Town of Big Piney, Wyoming
- Town of Granger, Wyoming
- Town of Hanna, Wyoming
- Town of LaBarge, Wyoming
- Town of Lander, Wyoming
- Town of Marbelton, Wyoming
- Town of Medicine Bow, Wyoming
- Town of Pinedale, Wyoming
- Town of Sinclair, Wyoming
- Town of Superior, Wyoming
- Town of Wamsutter, Wyoming

Consultation

The BLM is required to prepare EISs in coordination with any studies or analyses required by the Fish and Wildlife Conservation Act (16 U.S.C. 661 et seq.), the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.), and the National Historic Preservation Act (NHPA [54 U.S.C. 300101 et seq.]), as amended. In accordance with Executive Order 13175, the BLM must consult, government-to-government, with Native American tribes to ensure the tribes are informed about actions that may affect them.

Biological Resources

Under the provisions of Section 7(a)(2) of the Endangered Species Act of 1973, a federal agency that carries out, permits, licenses, funds, or otherwise authorizes an activity must consult with the USFWS, as appropriate, to ensure that the action is not likely to jeopardize the continued existence of any species listed under the Endangered Species Act of 1973 or to result in the destruction or adverse modification of designated critical habitat. During preparation of the environmental analysis, the BLM informally consulted with the USFWS regarding the effects of the Project on yellow-billed cuckoo.

Formal consultation on this issue, as well as the issue of water depletions, if warranted, will begin during discussion of the Agency Preferred Alternative after publication of the Draft EIS.

Cultural Resources

Section 106 (54 U.S.C. 306108) of the NHPA (54 U.S.C. 300101 et seq.) requires federal agencies to take into account the effect of their undertakings on any district, site, building, structure, or object that is included in or is eligible for inclusion in the National Register of Historic Places. Regulations for the implementation of Section 106 are defined in 36 CFR Part 800 – Protection of Historic Properties. These regulations define how federal agencies meet their statutory responsibilities as required under the law. The Section 106 process seeks to accommodate historic preservation concerns with the needs of federal undertakings through consultation between the agency official and other parties with an interest in the effects of the undertaking on historic properties (36 CFR 800.1 and 36 CFR 800.2). These parties include the Advisory Council on Historic Preservation (ACHP), State Historic Preservation Offices (SHPO), Native American tribes, state and other federal agencies, and individuals or organizations with a demonstrated interest in the undertaking due to their legal or economic relation to the undertaking or affected properties or their concern with the effects of undertakings on historic properties.

The BLM, as lead federal agency for compliance with Section 106 of the NHPA, initiated Section 106 consultation with the SHPO and others pursuant to 36 CFR Part 800.6 and 800.14(b) of the ACHP's regulations in July 2014. The Section 106 process is separate from, but is often conducted parallel with, the preparation of an EIS. Consultation under Section 106 of the NHPA is ongoing and will continue during post-EIS phases of RRNP implementation.

The BLM, in consultation with the Wyoming SHPO, agreed to develop a Programmatic Agreement between the various state and federal agencies and consulting parties with an interest in the Project. A Programmatic Agreement records the terms and conditions agreed upon to resolve the potential adverse effects of an undertaking in accordance with 36 CFR 800.14(b). The Programmatic Agreement outlines the stipulations that would be followed concerning the identification, assessment, and treatment of historic properties for the Project. Signatories agree that the Project will be administered in accordance with the stipulations set forth in the Programmatic Agreement. To date, the signatory parties include the BLM, the NPS Intermountain Region, the Omaha District of the USACE, the Wyoming SHPO, and the Applicant. The ACHP has declined to participate in consultation.

Consulting parties include the following:

- Alliance for Historic Wyoming
- Natrona County Commission, Wyoming
- Oregon-California Trail Association
- Sublette County Commission, Wyoming
- Sweetwater County Commission, Wyoming
- Cheyenne River Sioux Tribe
- Comanche Nation of Oklahoma
- Crow Creek Sioux Tribe
- Crow Tribe
- Eastern Shoshone Tribe of the Wind River Reservation
- Fort Peck Assiniboine and Sioux Tribes
- Northern Arapaho Tribe of the Wind River Reservation
- Northern Cheyenne Tribe
- Oglala Sioux Tribe
- Standing Rock Sioux Tribe
- Rosebud Sioux Tribe
- Shoshone-Bannock Tribes of the Fort Hall Reservation
- Ute Indian Tribe of the Uintah and Ouray Reservation
- Yankton Sioux Tribe

The Sisseton-Wahpeton Oyate Tribes declined to participate in consultation on the RRNP. Through the development of a Programmatic Agreement, the BLM and cooperating agencies have outlined a phased approach to fulfill the four requirements of Section 106: initiate consultation, identify historic properties, assess adverse effects, and resolve adverse effects. The first requirement parallels the NEPA processes of drafting the EIS, conducting public hearings/workshops, and finalizing the EIS. The steps of identifying historic properties and assessing adverse effects will be completed after the ROD is signed and the BLM issues the rights-of-way grant. The final step in the Section 106 process is the resolution of adverse effects, which will be documented in the historic properties treatment plan. The Programmatic Agreement will be complete prior to issuance of the ROD; however, stipulations will need to be included in the right-of-way grant requiring completion of agency-approved treatment of historic properties identified by agency archaeologists as needing further investigation before any Project-related ground-disturbing activities commence in the vicinity of the historic properties. If stipulations are included in the rights-of-way grant, the Authorized Officer would issue a Notice to Proceed upon satisfactory completion of each investigation or mitigation effort.

NHTs are a concern for the RRNP study area. The BLM has coordinated with the cooperating counties, the Alliance for Historic Wyoming, the NPS, and the Oregon-California Trails Association. The BLM invited the National Pony Express Trail Association and the Mormon Trails Association to be consulting parties, but they declined. On September 1, 2015, the BLM hosted a tour of NHT locations that may be affected by the RRNP to address specific concerns and provide explanation of design features and mitigation measures that will be incorporated into the Project.

The Programmatic Agreement is in draft form at present and is included in the Draft EIS (Appendix B); thus, the public may provide comment.

Native American Tribal Consultation

The United States has a unique legal relationship with Native American tribal governments, as set forth in the Constitution of the United States, treaties, executive orders (e.g., Executive Order 13175), federal statutes, federal policy, and tribal requirements, which establish the interaction that must take place between federal and tribal governments. An important basis for this relationship is the trust responsibility of the United States to protect tribal sovereignty, self-determination, tribal lands, tribal assets and resources, and treaty and other federally recognized and reserved rights. Government-to-government consultation is the process of seeking, discussing, and considering views on policy, and/or, in the case of this RRNP, environmental and cultural resource management issues. As part of the BLM's ongoing government-to-government consultation, tribal officials were informed of the RRNP and those who expressed interest in the Project will be consulted on the status of the RRNP through the completion of the NEPA and Section 106 processes. Government-to-government consultation activities often are combined with Section 106 tribal consultation activities.

For a list of federal and state legislation applicable to tribal consultation in the Project study area, please refer to Chapter 3, Section 3.2.8.1.

Early in the NEPA process, the BLM, in coordination with federal and state cooperating agencies, identified 14 Native American tribes that may have a traditional association with the Project area (Cheyenne River Sioux Tribe, Crow Tribe, Crow Creek Sioux Tribe, Eastern Shoshone Tribe of the Wind River Reservation, Fort Peck Assiniboine and Sioux Tribes, Northern Arapaho Tribe of the Wind River Reservation, Northern Cheyenne Tribe, Oglala Sioux Tribe, Rosebud Sioux Tribe, Shoshone-Bannock Tribes of the Fort Hall Reservation, Sisseton-Wahpeton Oyate Tribes, Standing Rock Sioux Tribe, Ute Indian Tribe of the Uintah and Ouray Reservation, and Yankton Sioux Tribe). The BLM initiated contact with the tribes in accordance with various environmental laws and executive orders. Initial contact with Native American tribes began on September 27, 2013, with a pre-application informational letter

introducing the proposed undertaking; soliciting feedback about concerns the tribes might have regarding the possible presence of TCPs or places of cultural, traditional, or spiritual importance in the Project area; and inviting them to attend the pre-application meetings. The pre-application meetings were held in Gillette, Wyoming, on October 30, 2013; in Lander, Wyoming, on October 31, 2013; and in Rock Springs, Wyoming, on November 1, 2013. The Tribal Historic Preservation Officer (THPO) for the Northern Arapaho Tribe of the Wind River Reservation was the sole tribal attendee at these pre-application meetings.

In letters dated July 9, 2014, the BLM initiated government-to-government consultation with the same 14 aforementioned Native American tribes. The BLM sent letters to the 14 Native American tribes and invited the tribes to participate in the Section 106 process as consulting parties and as cooperating agencies in the NEPA process. The letters notified the tribes of scheduled scoping meetings in Rock Springs, Big Piney, Lander, and Casper, Wyoming. The THPO for the Eastern Shoshone Tribe of the Wind River Reservation attended the scoping meeting in Lander on July 16, 2014. Subsequently, the BLM conducted follow-up telephone calls on August 8, 2014, to tribes that had not responded to the consulting party invitation letter. At the suggestion of the Eastern Shoshone Tribe of the Wind River Reservation, the Comanche Nation of Oklahoma was invited to be a consulting party in April 2015, bringing the total number of tribes invited to consult to 15 tribes.

Currently, 14 tribes are consulting parties for the Project, including the Cheyenne River Sioux Tribe, the Comanche Nation of Oklahoma, the Crow Tribe, the Crow Creek Sioux Tribe, the Eastern Shoshone Tribe of the Wind River Reservation, the Fort Peck Assiniboine and Sioux Tribes, the Northern Arapaho Tribe of the Wind River Reservation, the Northern Cheyenne Tribe, the Oglala Sioux Tribe, the Rosebud Sioux Tribe, the Shoshone-Bannock Tribes of the Fort Hall Reservation, the Standing Rock Sioux Tribe, the Ute Indian Tribe of the Uintah and Ouray Reservation, and the Yankton Sioux Tribe. The Sisseton-Wahpeton Oyate Tribes have formally declined to participate in consultation on the RRNP.

The tribes have been added to the RRNP mailing list and will receive regular updates via Project newsletters and public notices documenting the availability of EIS-related documents for review.

As part of the scoping process, several coordination meetings were held with the BLM and tribal representatives to provide an update about Project status, to ask for tribal representatives' views on the identification of places of concern, and to listen to any tribal concerns about the Project. These meetings were held with the Eastern Shoshone Tribe of the Wind River Reservation on July 14, 2014, February 12, 2015, and December 14, 2016; the Northern Arapaho Tribe of the Wind River Reservation on February 12, 2015; and the Ute Indian Tribe of the Uintah and Ouray Reservation on January 22, 2015, May 20, 2015, and October 19, 2016. A larger meeting was coordinated among the Northern Plains tribes in Rapid City, South Dakota, on November 6, 2014. The THPOs for the Cheyenne River Sioux Tribe, the Northern Cheyenne Tribe, and the Crow Tribe were present. In addition, the THPO for the Yankton Sioux Tribe called in to the meeting. The purpose of the meeting was for the BLM and the Applicant to listen to how the tribes would like to see the Section 106 process conducted for the Project, and, in particular, to discuss cultural resources identification efforts. For a list of Native American concerns discussed during the coordination meetings, refer to Chapter 4, Section 4.3.8, Table 4-67. In addition to the coordination meetings, Project updates were provided to the Shoshone-Bannock Tribes of the Fort Hall Reservation during a meeting between tribal leadership and BLM agency officials on October 9, 2014, in Fort Hall, Idaho. As part of the agenda for each meeting, the BLM presented the notes from previous coordination meetings with tribes.

A field visit of the Project area was held from September 28 to October 1, 2015, to provide tribal representatives with an overview of the location of the alternative routes, resources, and Project area. The field visit was conducted prior to the identification of the Agency Preferred Alternative so that the tribes

would have the opportunity to consider the alternative routes and provide feedback to the BLM. Representatives of eight tribes (Cheyenne River Sioux Tribes, Crow Creek Sioux Tribe, Crow Tribe, Eastern Shoshone Tribe of the Wind River Reservation, Northern Arapahoe Tribe of the Wind River Reservation, Northern Cheyenne Tribe, Rosebud Sioux Tribe, and Shoshone-Bannock Tribes of the Fort Hall Reservation) attended the field visit. The cultural resources sites and areas visited had been identified as potential concerns for the tribes. During the field visit, tribal representatives expressed concern pertaining to the Project, in general, and effects on culturally significant places and potentially significant sites and provided management recommendations for those resources of tribal concern. General concerns expressed by the tribes during the field visit are listed below.

- Effects on places of Native American concern (Boars Tusk and Chimney Butte landscapes);
- Effects from Project construction, operation, and maintenance on TCPs;
- Disruption of human burial sites;
- Need for tribal inventories;
- Tribal involvement in monitoring the construction of the pipeline and assisting in the identification of any finding; and
- Site confidentiality.

Based on the discussion during the field visit, there was no general consensus for Segment 1, since all the alternative routes were not visited, although the tribes expressed concern about Alternative 1C: Figure Four. Alternative 2A: Proposed Action to Alternative 3B: Lost Creek to Lost Cabin is the preferred route for Segment 2 and Segment 3.

A consultation meeting took place with the THPO of the Eastern Shoshone Tribe of the Wind River Reservation on December 14, 2016. The purpose of the meeting was to provide the THPO with an update on the Project, to provide information and ask for tribal views on the proposed crossing of the Green River by the pipeline, and to listen to any other tribal concerns about the Project.

The current status of tribal participation is summarized below.

- The BLM conducted pre-application meetings with tribes in October and November 2013.
- Fifteen Native American tribes have been contacted.
- Fourteen Native American tribes (Cheyenne River Sioux Tribe, Comanche Nation of Oklahoma, Crow Creek Sioux Tribe, Crow Tribe, Eastern Shoshone Tribe of the Wind River Reservation, Fort Peck Assiniboine and Sioux Tribes, Northern Arapaho Tribe of the Wind River Reservation, Northern Cheyenne Tribe, Oglala Sioux Tribe, Rosebud Sioux Tribe, Shoshone-Bannock Tribes of the Fort Hall Reservation, Standing Rock Sioux Tribe, Ute Indian Tribe of the Uintah and Ouray Reservation, and Yankton Sioux Tribe) are participating as consulting parties.
- The Sisseton-Wahpeton Oyate Tribes have formally declined consulting party status under the NHPA but would like to continue to receive information gathered during the NEPA process.
- As of the date of this Draft EIS, face-to-face meetings with tribal representatives, mainly THPOs or cultural resources staff, have taken place with eight tribes: the Cheyenne River Sioux Tribe, the Crow Tribe, the Eastern Shoshone Tribe of the Wind River Reservation, the Northern Arapaho Tribe of the Wind River Reservation, the Rosebud Sioux Tribe, the Northern Cheyenne Tribe, the Shoshone-Bannock Tribes of the Fort Hall Reservation, and the Ute Indian Tribe of the Uintah and Ouray Reservation. A tribal consultation meeting has taken place with the Shoshone-Bannock Tribes of the Fort Hall Reservation.
- Eleven Northern Plains tribes were invited to a meeting in Rapid City, South Dakota, to learn more about the Project and express any initial concerns.

- Representatives of the Rosebud Sioux THPO have participated in Project conference calls and reviews.
- All tribes were invited to attend a field visit of the RRNP alternative routes from September 28 through October 1, 2015. Representative of eight tribes (Cheyenne River Sioux Tribes, Crow Creek Sioux Tribe, Crow Tribe, Eastern Shoshone Tribe of the Wind River Reservation, Northern Arapahoe Tribe of the Wind River Reservation, Northern Cheyenne Tribe, Rosebud Sioux Tribe, and Shoshone-Bannock Tribes of the Fort Hall Reservation) attended.
- Letters were sent to all tribes on October 28, 2015, requesting their input regarding the RRNP alternative routes.
- A conference call for all tribes to solicit their input on RRNP alternative routes took place on November 20, 2015.
- Tribal consultation is ongoing for this Project, in the form of continued status updates and consultation meetings and conference calls among the participating tribes.
- Specific detailed records of field visit and, meetings, and documentation of other communications are on file in the Project administrative record.
- The BLM will safeguard any information that the tribes wish to remain confidential to the fullest extent of the law.

Scoping Process

An NOI was published in the *Federal Register* on June 6, 2014 (*Federal Register* Vol. 79, No. 2014-13395, pages 32975 -32979), announcing (1) the preparation of the EIS for the proposed RRNP and (2) the opportunity for public input through scoping. The publication of the NOI in the *Federal Register* marked the beginning of EIS preparation and the scoping process.

Four formal scoping meetings were held in July 2014 to introduce the RRNP, explain the purpose of and need for the RRNP, describe the RRNP, explain the planning and permitting process for the Project, and solicit comments useful for the environmental analysis.

Announcements to inform the public of the RRNP, the EIS preparation, and of the public scoping meetings were published in the *Federal Register* in media releases to local newspapers and radio stations, and as legal notices where applicable.

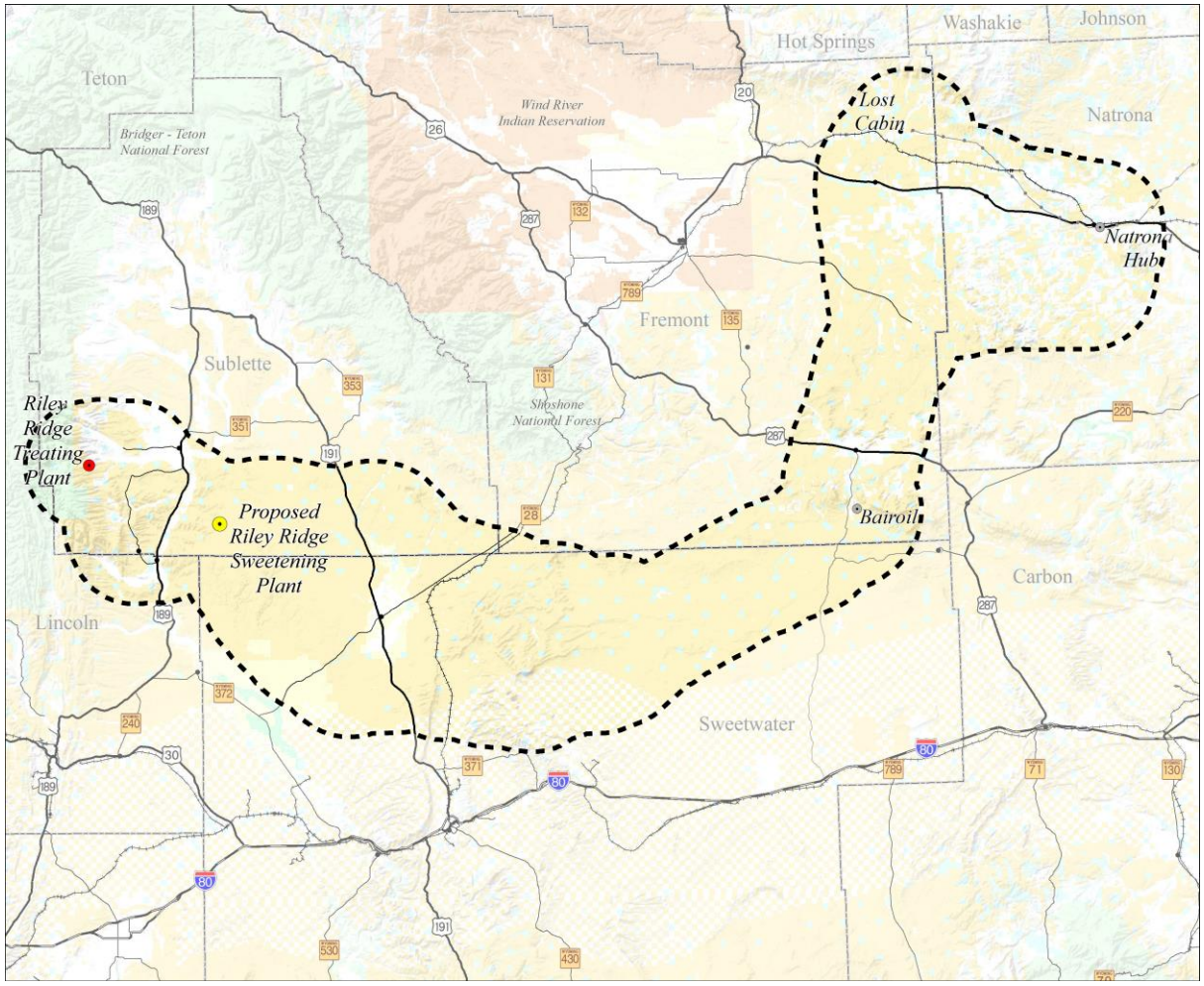
The scoping process is summarized in this EIS and documented in the *Final Scoping Report for the Draft Environmental Impact Statement for the Riley Ridge to Natrona Project* (BLM 2014a), which is available for viewing at the BLM Rock Springs Office and on the BLM website (http://bit.ly/2aW727l).

Chapter 1 – Purpose and Need

Chapter 1 – Purpose and Need

1.1 Introduction

This document, the Environmental Impact Statement (EIS), is being prepared in response to three applications for right-of-way submitted by Riley Ridge LLC (Denbury) and PacifiCorp, doing business as Rocky Mountain Power (collectively referred to as the Applicant), to the Bureau of Land Management (BLM) for the Riley Ridge to Natrona Project (RRNP or Project). Denbury submitted an *Application for Transportation and Utility Systems and Facilities on Federal Lands* (Standard Form 299) to the BLM for two underground pipeline projects: (1) the Riley Ridge Carbon Dioxide (CO_2) Pipeline Project (WYW-167867) and (2) the Bairoil to Natrona CO_2 Pipeline Project (WYW-168290). In addition, Denbury has proposed two hydrogen sulfide (H_2S) injection wells (WYW-181373) to be sited near the proposed Riley Ridge Sweetening Plant, which is included in the Riley Ridge CO_2 Pipeline Project application. PacifiCorp submitted an application for right-of-way for a 230-kilovolt (kV) overhead transmission line (WYW-185369) to supply power to the proposed Riley Ridge Sweetening Plant. The applications for rights-of-way grants for Denbury's Proposed Action were submitted to the BLM on February 19, 2013 (Denbury), and January 25, 2016 (PacifiCorp); the proposal for the injection wells was submitted to the BLM on September 12, 2013. The proposed Project location is shown on Map 1-1.



Map 1-1 General Project Location

The Proposed Action includes the following Project components:

- An underground non-gaseous H_2S/CO_2 pipeline from the existing Riley Ridge Treating Plant (a methane [CH_4] and helium recovery facility) to the proposed Riley Ridge Sweetening Plant, consisting of 31 miles of 16-inch-diameter pipe in Sublette County;
- A CO_2 underground pipeline from the proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect, consisting of 129 miles of 24-inch-diameter pipe, and continuing from the interconnect another 84 miles to the terminus at the Natrona Hub in Natrona County;
- The 4.3-acre proposed Riley Ridge Sweetening Plant, located on BLM-administered lands, would be constructed and operated to separate the CO_2 from the H_2S; the H_2S would be reinjected into deep geologic formations via two proposed injection wells;
- An approximately 1-mile-long 230kV overhead transmission line that would bring power to the Riley Ridge Sweetening Plant from an existing 230kV transmission line; and
- Ancillary facilities, such as roads, valves, flowlines, etc.

After reviewing the scope of the Project, the BLM, as the lead federal agency, determined the Proposed Action is a major federal action and would require preparation of an EIS in compliance with requirements of the National Environmental Policy Act of 1969 (NEPA), as amended and Council on Environmental Quality (CEQ) regulations for implementing NEPA (Code of Federal Regulations [CFR], Title 40, Parts 1500-1508).

The BLM published a Notice of Intent (NOI) to prepare the EIS in the *Federal Register* on June 9, 2014. Thirteen agencies are participating as cooperating agencies in preparation of the EIS, including the U.S. Fish and Wildlife Service (USFWS), the National Park Service (NPS), and the U.S. Army Corps of Engineers (USACE); the State of Wyoming (and associated departments); Fremont, Lincoln, Sublette, Sweetwater, and Natrona counties, Wyoming; and four conservation districts, Natrona County, Popo Agie, Sublette County, and Sweetwater County in Wyoming.

1.2 Bureau of Land Management's Purpose and Need

The BLM's purpose is to respond to the Applicant's right-of-way applications for the construction, operation, and maintenance of a project on federal land for the use of CO_2 for enhanced oil recovery (EOR) and the disposal of H_2S byproduct.

The need is established by the BLM's responsibilities under the Mineral Leasing Act of 1920 (MLA) (30 United States Code [U.S.C.] 185) and the Federal Land Policy and Management Act of 1976 (FLPMA) (43 U.S.C. 35). The need also is established under the BLM's responsibilities under the various statutes, regulations, and policies as described in Section 1.6.2.3.

Two right-of-way applications for the Project, including the Riley Ridge Sweetening Plant (Denbury), are being filed under the MLA for access across federal lands. The MLA authorizes and governs leasing of public lands for developing deposits of coal, phosphates, oil, gas, and other hydrocarbons and sodium. It also authorizes the Secretary of the Interior or appropriate agency head to grant rights-of-way for pipelines through federal lands, including BLM-administered lands, for transportation of oil, natural gas, synthetic liquid or gaseous fuels.

The right-of-way application for the 230kV overhead transmission line (PacifiCorp) is being processed under the FLPMA, which provides the BLM with discretionary authority to grant use (i.e., rights-of-way) of land they administer, taking into consideration impacts on natural and cultural resources (including historical resources). In doing so, the BLM must endeavor "to minimize damage to scenic and esthetic

values and fish and wildlife habitat and otherwise protect the environment" through avoidance or mitigation (FLPMA Title V).

1.3 Decisions to be Made

The decision to be made by the BLM is whether or not to issue rights-of-way to the Applicant to construct, operate, and maintain the proposed facilities on land it administers and under what terms and conditions. In so doing, the BLM, as lead agency, in coordination with the cooperating agencies, analyzes, through the EIS, the Applicant's plan for and the potential environmental impacts of constructing, operating, and maintaining the Project. Based on the analysis presented in this EIS, the BLM's decision will include whether or not to:

- Grant 30-year right-of-way to the Applicant (Denbury) to construct and operate the underground pipeline systems and associated above-ground facilities (e.g., Riley Ridge Sweetening Plant, meter stations, pigging facilities, and valves), including permanent access roads
- Grant 30-year right-of-way to the Applicant (PacifiCorp) to construct and operate the 230kV transmission line
- Approve the two injection wells
- Approve temporary workspace areas associated with the construction of the underground pipeline, including the temporary construction right-of-way, temporary work areas, pipe storage yards, and contractor yards
- Approve the temporary use of access roads associated with the construction of the underground pipeline

If the BLM grants the rights-of-way, the routes selected for the pipeline system and the transmission line, the terms and conditions and the agency-required mitigation requirements would be included in the grant authorization and Plan of Development (POD). In addition, if the BLM approves the injection wells, the conditions of the approval and the agency-required mitigation requirements will be included in the Surface Use Plan for the injection wells.

In accordance with 43 CFR Section 1610.0-5(b), actions that occur on federal lands administered by the BLM, including a decision to grant rights-of-way under the MLA or the FLPMA, are guided by decisions specified in the existing BLM Resource Management Plan (RMP). The pertinent RMPs for BLM-administered land potentially crossed by the Project are listed in Section 1.6.2.1.

1.4 Applicant's Interests and Objectives

The proposed Project would connect to Denbury's existing Greencore Pipeline to provide additional quantities of CO_2 for delivery to the Bell Creek Field and other fields that will utilize the CO_2 for EOR in southeastern Montana.

Non-gaseous phased CO_2 is injected into subsurface oil-bearing formations to enhance oil production from existing and depleted oil wells to stimulate oil production. CO_2 is a common, ordinary compound usually thought of as a gas, although it is quite easily converted to a solid or liquid.

As an oil field ages, the natural oil reservoir pressure declines; thus, pumping becomes less efficient. To recover some of the remaining oil, it becomes necessary to employ enhanced methods of oil recovery, such as water flooding. Water flooding consists of injecting water into wells and forcing it into the oil reservoir. As the water spreads out from the injection site, it pushes some of the remaining oil toward producing wells. Water flooding is relatively inexpensive to employ, is effective in displacing oil and

increasing the pressure in the reservoir, and can increase oil recovery from approximately 15 to 25 percent. Even after these secondary methods have been completed, as much as 60 percent or more of the original oil reserves are left in the ground. At this point, other tertiary or enhanced recovery methods become necessary to liberate some of the remaining reserves. Injection of CO_2 to increase oil recovery was first patented in 1952. Large-scale commercial CO_2 flooding occurs in Utah, Texas, Mississippi, Colorado, New Mexico, Oklahoma, Louisiana, and Wyoming. The first commercial application of CO_2 flooding in Wyoming was Amoco's Bairoil Project, which began injection of CO_2 in October 1986 (BLM 1989).

Carbon dioxide works to increase the volume of recoverable oil in several ways. In most reservoirs, CO_2 is easily miscible with the oil and can be thoroughly mixed at relatively low pressures. Once mixed, CO_2 is highly soluble. As it dissolves, it swells the oil, yielding a 10 to 30 percent increase in volume (Miller and Jones 1981). This swelling forces more oil out of the reservoir pores, making it available for recovery. In addition, CO_2 decreases the viscosity of oil, allowing it to flow more freely. CO_2 also aids recovery by solution gas drive. Just as CO_2 goes into solution with an increase in reservoir pressure, gas will come out of solution and continue to drive oil into the wellbore. Finally, the slightly acidic nature of the carbon dioxide-water mixture promotes certain injectivity changes. Clays are stabilized due to a reduction in pH, and injectivity is improved in carbonates by increased permeability. The CO_2 flooding technique is similar to water flooding except that the CO_2 gas acts as a solvent to reduce the viscosity of oil, rendering it more mobile, while maintaining pressure in the reservoir.

The Greencore Pipeline was completed in 2012 and transports non-gaseous phase CO_2 to the Bell Creek Field in southeastern Montana, where it is injected for producing oil in EOR operations at the Bell Creek Field. Ultimately, the current proposed RRNP would provide a connection between the existing Riley Ridge Gas Plant and the Bell Creek Field. It is estimated that the CO_2 injected via the Project would increase oil production of existing wells by as much as five-fold. Consequently, the Project would access known reserves and supply domestic energy supplies.

1.5 Federal Approval Process Authorizing Actions

In accordance with federal laws governing the management and use of federal lands and laws governing interstate commerce, federal agencies may grant long-term utility uses on federal land, subject to compensation and environmental stipulations. To reach decisions to grant utility uses, the agencies need to: (1) evaluate Project conformance with federal land management plans and policies, where applicable; (2) determine whether the Applicant's committed measures, also referred to as design features of the Proposed Action for environmental protection, are sufficient to adequately protect the natural and human environment; and (3) after consideration of any significant residual environmental impacts (i.e., after stipulations and mitigation measures have been applied), decide whether the Project is in the public interest. Projects operating on federal lands also may require additional plans and monitoring. The following sections describe the major federal authorizing actions required for the Project to proceed.

1.5.1 Bureau of Land Management

The BLM is responsible for issuing right-of-way grants across federal lands in accordance with 43 CFR 2800, 2880, and 3162. Specifically, 43 CFR 2805 identifies the terms and conditions of the grants, including fees. In addition, 43 CFR 2881.11, requires a BLM right-of-way grant for any oil or gas pipeline or related facility that crosses federal land under the BLM's jurisdiction or under the jurisdiction of two or more federal agencies. The regulations for the application filing, content, processing, and decision steps in granting a right-of-way are described in 43 CFR 2884. At 43 CFR 3162 are the requirements for operating rights-of-way to protect natural resources, life, and property that results in maximum economic recovery of oil and gas with minimum waste and with minimum adverse effect on ultimate recovery of other mineral resources.

In addition, as described in 43 CFR 3160, the BLM has authority to review and approve the injection wells on federal land under the BLM's jurisdiction. The conditions of the approval and the agency-required mitigation requirements will be included in the Surface Use Plan for the injection wells.

The BLM also has the authority and responsibility under the MLA to grant rights-of-way for pipelines and is responsible for imposing stipulations and regulations to protect public safety and the environment. Mitigation measures and other applicable stipulations for avoidance, minimization, and mitigation of the environmental impacts resulting from the implementation of this Project are identified in this EIS and will be carried forward into the Applicant's final POD. The EIS-identified measures include those measures stipulated in BLM RMPs. On federal lands administered by the BLM, the POD would be an enforceable stipulation of the BLM right-of-way grant and temporary-use authorization from the BLM. As such, all mitigation measures and stipulations identified as applicable in any of the POD volumes should be adhered to for the life of the BLM right-of-way grant. The federal land-management agencies require that, as part of the Applicant's right-of-way grants, mitigation measures and other specific stipulations and methods identified in the POD would be implemented over the entire length of the Project, regardless of jurisdiction, while understanding the federal land-management agencies do not have the authority to enforce mitigation measures on state and private land.

The BLM would prepare a Record of Decision (ROD) to document its decision to either approve or deny the Project. If approved, the following documentation would be attached to the ROD and the subsequent right-of-way grants issued by the BLM: (1) environmental protection measures for federal lands; (2) a concurrence letter or Biological Opinion from the USFWS; (3) a Programmatic Agreement under Section 106 of the National Historic Preservation Act (NHPA) signed by the BLM, the State Historic Preservation Officer (SHPO) in Wyoming, the Applicant, and other appropriate consulting parties; and (4) additional mitigation measures or permit conditions required by the BLM, USACE, USFWS, or the State of Wyoming.

Section 106 (54 U.S.C. 306108) of the NHPA (54 U.S.C. 300101 et seq.), as amended, requires the lead federal agency, the BLM, to take into account the effects of its undertakings on historic properties that are on, or are eligible for listing on, the National Register of Historic Places (NRHP). In addition to Section 106 of the NHPA, the BLM also is responsible for compliance with the American Indian Religious Freedom Act of 1978 and the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA), among a host of other laws, Executive Orders, and policies. NAGPRA would apply if burials or objects of cultural patrimony are affected by the Project on federal lands; applicable state laws would apply if burials or objects of cultural patrimony are affected on state or private lands. Compliance with the NHPA and the American Indian Religious Freedom Act of 1978 would require consultation with the tribes on the effects of the Project to sites of tribal importance. Such sites include archaeological sites, traditional cultural properties (TCP), and spiritual sites.

1.5.2 Advisory Council on Historic Preservation

The Advisory Council on Historic Preservation (ACHP) is afforded an opportunity to comment if there would be adverse effects on historic properties resulting from a project. The ACHP was invited to participate in Section 106 consultation for the Project and has declined, although the Council may enter the process at any time.

1.5.3 U.S. Fish and Wildlife Service

The USFWS is responsible for ensuring compliance with the Endangered Species Act (ESA). The BLM is responsible for initiating consultation with the USFWS to determine the likelihood of effects on federally listed species. Section 7 of the ESA, as amended, states that any project authorized, funded, or conducted by any federal agencies should not "jeopardize the continued existence of any endangered

species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined …to be critical…" (16 U.S.C. 1536(a)(2)(1988)). The BLM and the Applicant, as a non-federal party, are required to consult with the USFWS to determine whether any federally listed or proposed endangered or threatened species or their designated critical habitat are in the vicinity of the Project. If, upon review of existing data, the BLM determines that these species or habitats may be affected by the Project, the BLM is required to prepare a Biological Assessment to identify the nature and extent of adverse impact, and to recommend mitigation measures that would avoid the habitat and/or species or that would reduce the potential impact to acceptable levels. If, however, the BLM determines that no federally listed or proposed endangered or threatened species or their designated critical habitat would be affected by the Project, no further action by the BLM is necessary.

A Biological Assessment with the BLM's findings will be prepared to assist in the determination of the Project's effect on federally listed threatened and endangered, candidate and proposed species. The USFWS will then prepare a concurrence letter for effects determination to be not likely to adversely affect or a Biological Opinion on whether the proposed activity will jeopardize the continued existence of a listed species.

1.5.4 Office of Pipeline Safety

The Office of Pipeline Safety (OPS) within the U.S. Department of Transportation (USDOT) is the primary enforcement agency that administers the Department's national regulatory program to assure the safe transportation of natural gas, petroleum, and other hazardous materials by pipeline. Federal regulations governing the construction and safe operation of pipelines are enforced by the OPS. Should this pipeline right-of-way be granted, the OPS would conduct regular audits of pipeline facilities in the future to enforce continual compliance with federal regulations.

1.5.5 U.S. Army Corps of Engineers

Section 404 of the Clean Water Act (CWA) establishes a permit program administered by the USACE to regulate the discharge of dredge and fill materials into the waters of the United States (U.S.), including their adjacent wetlands. This Project would be under the jurisdiction of USACE Omaha District for the issuance of a Nationwide Permit 12 for utility construction. A number of general conditions must be complied with under these nationwide permits. Such conditions involve avoiding, minimizing impacts, or mitigating impacts on aquatic life movement, fish spawning areas, public water supply intakes, endangered species, and other resources. Soil erosion and sediment controls, management of water flows, removal of temporary fills, and compliance with regional or case-specific conditions are also required under the USACE permits issued for the Project.

1.6 Permits and Relationship to Non-Federal Policies, Plans, and Programs

1.6.1 Permits

The Project crosses federal, state, and private land and is subject to federal, state, and local permit requirements. The Applicant would be required to obtain all federal, state, and local permits and approvals prior to construction of the Project. Table 1-1 is a list of permits and/or approvals required prior to construction.

Table 1-1 Permits and Approvals Required		
Issuing Agency/Program/ Permit Name	**Permits/Approvals/ Authorizing Actions**	**Application Project Component**
Federal Permits, Approvals, and Authorizing Actions		
Bureau of Land Management		
National Environmental Policy Act/Environmental Impact Statement	EIS development oversight by lead agency, EIS review and approval, issuance of ROD	All Project components on federal land and connected actions
Lead Federal Agency	Notices to proceed subject to (1) cultural resource compliance with applicable state and federal laws as stipulated in the Programmatic Agreement developed for the Project and (2) paleontological resources compliance with applicable federal laws	All Project components
Right-of-Way Grant, Temporary Use Permits	Right-of-way grant for pipeline and access roads and other facilities on BLM-administered lands per the Minerals Leasing Act; temporary-use permits for facilities and pipelines	Access roads, associated facilities, and pipelines that are located on federal lands
Application for Permit to Drill	Permit to conduct drilling on BLM-administered lands	Permit to drill injection wells on BLM-administered land
U.S. Army Corps of Engineers		
Permit for Dredged or Fill Material (404 Permit)	Placement of fill or dredged material in waters of the U.S. or adjacent wetlands	All surface-disturbing activities affecting waters of the U.S. or wetlands
U.S. Fish and Wildlife Service		
Endangered Species Act	Informal or formal consultation for threatened and endangered species	All Project components
U.S. Environmental Protection Agency		
Clean Water Act	Spill prevention, control, and countermeasure plans	All Project components; transfer and storage of fuels and oils
Bureau of Alcohol, Tobacco, Firearms and Explosives		
Permit 5400-13	Application for Explosives License or Permit	Blasting to facilitate excavation and construction
State Permits, Approvals, and Authorizing Actions		
Wyoming Department of Environmental Quality		
Wyoming Air Quality Permits	Permits for emissions from new or modified sources; prevention of significant deterioration (if applicable); control of hazardous air pollutants (HAP), H_2S, volatile organic compounds (VOC), and New Source Review (NSR)	All stationary fuel-burning sources, tanks, separators, dehydrators, and NSR
General Permit to Discharge Stormwater Associated with Large Construction Activity	Stormwater construction permits; Large Construction Permit WYR10-0000	All ground-disturbing activities; disturbance of more than 5 acres
Industrial Siting Permit	Permit to site/construct large industrial project (construction cost greater than $190.8 million)	Entire project
General Permit to Discharge Stormwater Associated with Industrial Activity	Stormwater permit for applicable operations	Riley Ridge Sweetening Plant

Table 1-1 Permits and Approvals Required		
Issuing Agency/Program/ Permit Name	**Permits/Approvals/ Authorizing Actions**	**Application Project Component**
Temporary Turbidity Waiver	Construction activities that would cause short-term or temporary violations of state water quality standard for turbidity	Stream crossings or near stream activities that would discharge storm water to stream
General Permit for Temporary Discharges	Temporary discharge of water encountered during construction	Facility and underground pipeline construction
Clean Water Act Section 401 Certification	Review and certification for USACE 404 permits	All surface-disturbing activities affecting waters of the U.S. or wetlands
Wyoming Department of Transportation		
Transport Permits	Permit for oversize, over-length, and overweight loads	Transportation of equipment and materials on federal and state highways
M-54 License	Required to place a utility within Wyoming Department of Transportation (WYDOT) right-of-way	Boring pipeline under federal and state highways
Wyoming Oil and Gas Conservation Commission		
Underground Injection Control (UIC) Permit/Approval	Class II Injection/disposal wells	Underground injection/ disposal wells
Wyoming Office of State Lands and Investments		
Authorization of activities on state land	Approval of oil and gas leases, rights-of-way, temporary-use permits, and developments on state land	Facilities on state land
Wyoming State Engineer		
Water Agreement for Temporary Use of Water	Temporary water use for hydrostatic testing and dust abatement	Underground pipeline and facility construction
Application for Permit to Appropriate Groundwater	Approval for use of groundwater	Water use for construction, operation, or maintenance activities
Wyoming State Historic Preservation Office		
Wyoming State Historic Preservation Office	Letter of concurrence with lead federal agency determinations of eligibility and effects, Signatory to Programmatic Agreement	All Project components
Local Permits, Approvals, and Authorizing Actions		
Sublette, Sweetwater, Fremont, and Natrona Counties		
Road Use Authorization	Overweight and over-length loads on county roads	Transportation of equipment and materials on county roads
Conditional Use and Special Use Permits, Zoning	New structures	Associated facilities
County Road Access	Construction of new roads that connect to county roads	Project access roads
Other permits and approvals	Control of noxious weeds, fire prevention, hazardous materials storage, boring under local roads	Underground pipeline and facility construction

1.6.2 Relationship to Other Policies, Plans, and Programs

Major federal actions that may have significant impacts on the human environment require preparation of an EIS. To this end, consideration of the Proposed Action is pursuant to NEPA and is consistent with federal guidelines for implementing NEPA, including the CEQ Regulations for Implementing the

Procedural Provisions of NEPA, outlined in 40 CFR Parts 1500-1508, U.S. Department of the Interior (DOI) guidance in 43 CFR Part 46, and BLM policies and manuals (BLM NEPA Handbook H-1790-1).

1.6.2.1 Conformance with Bureau of Land Management Plans and Policies

BLM-administered lands are administered with direction provided in land-use plans that establish the goals and objectives for the management of the resources and land uses. BLM RMPs must be prepared in accordance with FLPMA and regulations at 43 CFR 1600. The Project area includes land administered by:

- Record of Decision and Approved Casper Resource Management Plan. December 2007 (amended 2009, 2010, 2011, and 2012)
- Record of Decision and Approved Resource Management Plan for the Lander Field Office Planning Area. June 2014
- Record of Decision and Approved Pinedale Resource Management Plan. November 2008
- Record of Decision and Approved Rawlins Resource Management Plan. December 2008 (amended 2012, 2013, and 2014)
- Record of Decision and Approved RMP Amendments for the Rocky Mountain Regions, Including the Greater Sage-Grouse Sub-Regions of Lewistown, North Dakota, Northwest Colorado, Wyoming and the Approved Resource Management Plans for Billings, Buffalo, Cody, HiLine, Miles City, Pompeys Pillar National Monument, South Dakota, Worland. September 2015.
- Record of Decision and Green River Resource Management Plan. October 1997 (RMP revision planned for 2nd Quarter of 2018)

BLM Manual 6310, Conducting Wilderness Characteristics Inventory on BLM Lands (Public), states that for lands with wilderness characteristics "This policy contains the BLM guidance and general procedure for conducting wilderness characteristics inventories under Section 201 of FLPMA and supersedes all previous guidance on this topic." Under this policy the BLM will conduct inventories of public lands for the presence or absence of wilderness characteristics, by considering the, "…validity of proposed boundaries of the area(s), the existence of wilderness inventory roads and other boundary features, the size of the area(s), and the presence or absence of wilderness characteristics." Once potential lands with wilderness characteristics units have been identified, a complete inventory performed, where the BLM considers the size, naturalness, and outstanding opportunities for solitude or a primitive and unconfined type of recreation, as well as any supplemental values. If an inventory meets these criteria, the area is documented as containing wilderness characteristics (BLM 2012b).

BLM Manual 6320 considers lands with wilderness characteristics in the BLM Land Use Planning Process (Public) and establishes BLM policy on considering lands with wilderness characteristics in land-use plans and land-use plan amendments and revisions in accordance with FLPMA and other applicable authorities. By using the land-use planning process, the BLM can determine how to manage the lands with wilderness characteristics as part of the BLM's multiple-use mandate. A NEPA document will be completed to reach a planning decision for these units, outlining the management actions with allowable uses and restrictions (i.e., right-of-way exclusion or avoidance area [BLM 2012c]).

Also, BLM Manual 6280, Management of National Scenic and Historic Trails and Trails under Study or Recommended as Suitable for Congressional Designation, provides the line management and program staff with policies for the management of National Scenic and Historic Trails (BLM 2012a).

1.6.2.2 Consistency with Local Land Management Plans and Policies

The BLM reviewed the land-use plans for the State of Wyoming as well as the Sublette, Sweetwater, Fremont, and Natrona counties and considered the land-management objectives and policies established in the plans. The State of Wyoming does not have a comprehensive plan for the Project area.

The *Wyoming Office of State Lands and Investments* manages Wyoming Trust Lands and The Wyoming State Land Trust consists of three assets: State Trust Land, State Trust Minerals, and State Permanent Land Fund. All three assets derive from those lands granted by the federal government to the State of Wyoming at the time of statehood under various acts of the U.S. Congress and accepted and governed under Article 18 of the Wyoming Constitution. The revenues generated by trust land and minerals are reserved for the exclusive benefit of the beneficiaries designated in the congressional acts. The beneficiaries are the common (public) schools and certain other designated public institutions in Wyoming such as the Wyoming State Hospital (Wyoming Office of State Lands and Investments 2013).

The *Sublette County Comprehensive Plan* (Sublette County 2003), as amended in 2005, identifies goals and policies to promote open communication and active participation of the county with federal and state agencies in land-use planning and decision making. Goals and policies include balancing economic development with conservation of natural resources; protecting sensitive environmental resources; ensuring consideration of county interests in federal and state planning and decision making; and encouraging multiple-use land management that complies with federal and state regulations, is consistent with the county plan, and is mutually beneficial for each entity. County policies indicate their request to participate "at the earliest opportunity, in any public land/resource issue affecting the ecological, economic, cultural, or social wellbeing of Sublette County citizens; even to the point of acquiring cooperating agency status."

The *Sublette County Federal & State Land Use Policy* (Sublette County 2009) supports a high-level of collaboration and cooperation between agencies when engaging in land-use planning activities. The purpose of this plan is to identify "recommendations and policies for land management and use on federal and state lands within the county." Principles identified in the policy encourage federal and state lands management that promotes the health, safety, environment, and well-being of the county's citizens, while stimulating the economy and being sensitive to local and state governments. Principal intents of this policy are to "protect the integrity of environmental systems and natural resources; preserve resource-based industries; promote a robust, diverse and stable economy; minimize conflicts between land uses; protect public health, safety and welfare; promote an understanding of the dynamics and benefits to and from agriculture and other multiple-use activities and federal land concerning wildlife; preserve culture, customs, heritage, and economic diversity; and recognize and protect private rights and interests in federal and state land resources including rights-of-way and public access, grazing permits, water rights, special-use permits, leases, contracts, and recreation use permits and licenses."

The *Sublette County Conservation District Long Range Plan 2014-2019* (Sublette County Conservation District 2014) supports collaboration with federal land management agencies "in development of and coordination of land management plans." The objectives of the long-range plan are to (1) "actively seek and participate in planning processes as a coordinating agency," and (2) "represent and advance the policies stated within the District's Public Land Use Policy booklet, developed through public processes and filed with the Sublette County Clerk."

The *Sweetwater County Comprehensive Plan* (Sweetwater County 2002) supports participation in federal and state land-use planning activities and encourages communication among agencies. The objective of the county plan is to "promote agency awareness of county issues and interest. These include, but are not limited to, natural resource exploration and development, multiple-use land and resource-management practices, agriculture/ranching, and recreation, and adequate public access to and across public lands."

Goals of the comprehensive plan include (1) encourage/support interaction between local, state, and federal agencies and private landowners; (2) encourage and support environmentally responsible resource development; (3) encourage a balance between resource development and environmental protection; (4) recognize and protect the county's unique cultural, recreational, environmental, and historical resources; (5) encourage the location of associated worker housing within existing communities where services are/can be provided; (6) support the county's traditional land uses and interests; (7) promote local (private) concerns and interests as an integral part of public land management decisions; and (8) encourage the proactive, coordinated planning and delivery of public utilities and infrastructure services.

The *Sweetwater County Conservation District Land and Resource Use Plan and Policy* (Sweetwater County 2011) was developed to translate the Conservation District's "statutory mandate into land management policy direction" and is a guide for federal, state, and local decision-makers in educating and addressing natural resources management concerns that would include "water quality and quantity, grazing management, wildlife conservation, tree establishment, land-use planning, public education efforts, and conservation…."

The *Fremont County Land Use Plan* (Fremont County 2004) indicates, "The goal of this plan is to assert the rights granted under the laws of the United States of America and the State of Wyoming, to a voice in the planning and regulation of the federally or State managed lands within the borders of Fremont County Wyoming. The high percentage of federally or State managed land in this county has led to a dependency on the rights of use of this land to the economic base and culture of this area. The goal of the Fremont County Land Use Plan is to secure the right of use of the federally or State managed land on no more restricted level than is spelled out by the accompanying plan components for Water, Timber, Grazing, Mining and Minerals, Endangered Species, Recreation, and Transportation, and others." The stated objectives are to, "strive for current or higher levels of use and development of federally or State managed lands and natural resources to occur alongside commonsense conservation for future generations. To require credible science to be employed in any decisions made regarding lands and resources in Fremont County."

Natrona County 2040 (Natrona County 2014) serves as a reference document and helps guide the development department and governing bodies when considering all of Natrona County's land-use planning. This plan is an update to the 1998 Development Plan. The Natrona County 2040 plan reflects recent and projected growth-related changes in the county and helps guide the Natrona County Planning Department and governing bodies when considering land-use planning decisions.

The *Wyoming's Action Plan for Energy, Environment and Economy* (Wyoming Office of the Governor 2013) serves as a framework to create an efficient problem-solving tool to balance energy regulation, land management, and planning.

1.6.2.3 Major Authorizing Laws, Regulations, and Policies

This EIS is being prepared by the BLM in compliance with federal regulations and guidelines (Table 1-2), principally NEPA, CEQ regulations, and other applicable regulations for implementing the procedural provisions of NEPA, and considering tribal, state, and county requirements.

Table 1-2
Major Federal Authorizing Laws, Regulations, and Policies

Law and Regulation	Reference
American Indian Religious Freedom Act of 1978	42 U.S.C. 1996
Antiquities Act of 1906	54 U.S.C. 320301 et seq.
Archaeological Resources Protection Act of 1979, as amended	54 U.S.C. 302101
Bald and Golden Eagle Protection Act of 1972 (BGEPA)	16 U.S.C. 668

Table 1-2 Major Federal Authorizing Laws, Regulations, and Policies	
Law and Regulation	**Reference**
BLM Land Use Planning Handbook H-1610-1 (2005)	BLM Manual Release 1-1693
BLM regulations	43 CFR § 2800, 2880, and 3162
BLM NEPA Handbook H-1790-1 (2008)	BLM Manual Release 1-1710
Clean Air Act of 1963 (CAA)	42 U.S.C. 7401 et seq.
Clean Water Act of 1972	33 U.S.C. 1251 et seq.
Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLIS)	42 U.S.C. 9601-9675
Consultation and coordination with Indian tribal governments	Executive Orders 13084 and 13175
Council on Environmental Quality's regulations for implementing NEPA	40 CFR 1500 et seq.
Department of the Interior's implementing procedures and proposed revisions	65 *Federal Register* 52211-52241
Departmental responsibilities for Indian trust resources	512 Department Manual 2.1
Endangered Species Act of 1973	16 U.S.C. 1531 et seq.
Environmental justice in minority populations and low-income populations	Executive Order 12898
Federal compliance with pollution control standards	Executive Order 12088
Farmland Protection Policy Act of 1981	Public Law (P.L.) 97-98, Subtitle I of Title XV, Sections 1539-1549
Federal Land Policy and Management Act of 1976	43 U.S.C. 1701 et seq.; 43 CFR 2800 (BLM FLPMA regulations covering special uses)
Floodplain management	42 U.S.C. 4321; Executive Order 11988
General Mining Law of 1872, as amended and Surface Resources Act of 1955	30 U.S.C. 29; 43 CFR 3860
Indian sacred sites	Executive Order 13007
Materials Act of 1947, as amended	30 U.S.C. 601 et seq.
Memorandum for the Heads of Executive Departments and Agencies on Government-to-Government Relations with Native American Tribal Governments of 1994	Signed by President Clinton on April 29, 1994
Migratory Bird Treaty Act (MBTA) of 1918	16 U.S.C. 703 et seq.; Executive Order 13186
Multiple Surface Use Mining Act of 1955	30 U.S.C. 611
Mineral Leasing Act of 1920	30 U.S.C Part 185
National Environmental Policy Act	42 U.S.C. 4371 et seq.; 36 CFR 800
National Environmental Policy Act, Protection and Enhancement of Environmental Quality	Executive Order 11512
National Historic Preservation Act of 1966 and regulations implementing the National Historic Preservation Act	54 U.S.C. 300101 et seq.; 36 CFR 800
National Trails System Act of 1968 (NTSA)	16 U.S.C. Sections 1241 et seq.
Native American Graves Protection and Repatriation Act of 1990	25 U.S.C. 3001 et seq.
Noise Control Act of 1972, as amended	42 U.S.C. 4901 et seq.
Noxious weeds and invasive species	Executive Order 13112
Occupational Safety and Health Act of 1970 (OSHA)	29 U.S.C. 651 et seq. (1970)
Oil Pollution Act of 1990	33 U.S.C. 2701
Paleontological Resources Preservation Act of 2009 (PRPA)	16 U.S.C. 470aaa et seq.
Pollution Prevention Act of 1990	42 U.S.C. 13101 et seq.
Protecting wilderness characteristics on lands managed by the BLM	Secretarial Order 3310, December 22, 2010
Protection and enhancement of the cultural environment	Executive Order 11593
Protection of wetlands	42 U.S.C. 4321; Executive Order 11990

Table 1-2 Major Federal Authorizing Laws, Regulations, and Policies	
Law and Regulation	**Reference**
Rangeland health and standards and guides for grazing administration	43 CFR 4180
Resource Conservation and Recovery Act of 1976 (RCRA)	42 U.S.C. 6901 et seq.; 42 U.S.C. 6992k
Responsibilities and the Endangered Species Act	Secretarial Order 3206, June 5, 1997
Rivers and Harbors Act of 1899	33 U.S.C. 401, 403, 407
Safe Drinking Water Act of 1974	42 U.S.C. 300f et seq.
Standards for rangeland health and guidelines for grazing management for BLM-administered lands in Utah	43 CFR 4180
Wild and Scenic Rivers Act of 1968	P.L. 90-542; 16 U.S.C. 1271 et seq.

1.7 Non-Federal Right-of-Way Easement Acquisition Process

The private land easement, usually negotiated with the landowner, is the legal instrument used to convey a right-of-way easement to the Applicant. The easement gives the company the right to operate and maintain its pipeline in the permanent right-of-way and, in return, compensates the landowner for the use of the land. The easement negotiations between the Applicant and the individual landowner would include compensation for loss of use during construction, loss of nonrenewable or other resources, and the restoration of unavoidable damage to property during construction. Although the BLM does not have the legal authority to impose all stipulations on private lands, private landowners may negotiate with the Applicant through their easement agreements to implement stipulations on their own land. If an easement cannot be negotiated with the landowner, the Applicant may acquire the easement needed for pipeline construction under federal and state eminent domain laws.

1.8 Public Review and Comment

As a part of its environmental review of the proposed RRNP, the BLM initiated and conducted a public scoping process designed to assist in the identification of potential environmental concerns related to the Project. The scoping process is described in detail in the final Scoping Report for the Project (BLM 2014a), along with a summary description of the proposed RRNP, a listing of the participants in the scoping process, a summary of the issues identified during the formal scoping period, and copies of the comment letters and comment forms received.

1.8.1 Scoping

The formal scoping comment period for the proposed Project began with publication of the NOI to prepare an EIS for the Project, in the *Federal Register* on June 9, 2014. As noted in the NOI, the formal scoping period was initially intended to end on July 9, 2014; however, on June 27, 2014, the BLM announced that the formal scoping period would be extended until August 1, 2014.

The NOI provided information on the proposed Project and the public involvement process during the environmental review, identified potentially significant environmental issues, and described the additional reviews and consultations that will be incorporated into the Draft EIS. The NOI encouraged public involvement and solicited comments regarding the proposed RRNP, provided information on how to submit comments on the Project, identified the locations of the scoping meetings, and provided the public with a point of contact for the BLM. Notifications of the dates, times, and locations of the scoping meetings were separately published in the *Federal Register* and in state and local newspapers. The notifications of the scoping meetings were also sent by U.S. mail to known stakeholders and to local radio

stations. The BLM Rock Springs Field Office posted on its website both the notification of the opening of the scoping period and the notification that the BLM extended the scoping period to August 1, 2014.

The BLM held scoping meetings in July 2014 to obtain public comments on the Project. The meetings took place from 4 to 7 p.m. at the following locations:

- July 14 – Holiday Inn, 1675 Sunset Drive, Rock Springs, Wyoming
- July 15 – Marbleton Town Hall, 10700 Highway 189, Big Piney, Wyoming
- July 16 – Rodeway Inn/Pronghorn Lodge, 150 E. Main Street, Lander, Wyoming
- July 17 – Ramada Plaza Riverside, 300 West F Street, Casper Wyoming

The locations were chosen on the basis of convenience to the public throughout the primary region potentially affected by the Project, capacity of the available facilities, and accessibility to the public. A total of 30 individuals attended the public scoping meetings, excluding the BLM and the Applicant representatives and their contractors who participated in the meetings.

During the scoping period, the BLM provided the public with a variety of methods to comment on the proposed RRNP:

- Orally and in writing at the scoping meetings
- By email to BLM_WY_RRNP@blm.gov
- By U.S. mail to the BLM High Desert District office

The issues identified during public and agency scoping are presented in Table 1-3.

1.8.2 Consultation and Coordination

In conformance with CEQ regulations implementing NEPA, the BLM invited 56 federal and state agencies, Native American tribes, and local governmental entities to participate as cooperating agencies in the preparation of the EIS (40 CFR 1501.6). Of the 56 invited, 13 accepted the invitation and are participating. Following is a list of the agencies invited, and those participating are marked with an asterisk.

1.8.2.1 Federal Agencies

- USFWS – Wyoming: Ecological Services*
- NPS – National Trails*
- USACE*
- U.S. Environmental Protection Agency (EPA), Region 8 (EPR-N)
- U.S. Forest Service (USFS)
- U.S. Department of Energy (DOE)
    - Office of Compliance
    - Office of Legacy Management
    - Western Area Power Administration
- USDOT – Pipeline and Hazardous Material Safety Administration (PHMSA)

1.8.2.2 Tribes

- Cheyenne River Sioux Tribe
- Comanche Nation of Oklahoma
- Crow Creek Sioux Tribe
- Crow Tribe

- Eastern Shoshone Tribe of the Wind River Reservation
- Fort Peck Assiniboine and Sioux Tribes
- Northern Arapaho Tribe of the Wind River Reservation
- Northern Cheyenne Tribe
- Oglala Sioux Tribe
- Rosebud Sioux Tribe
- Shoshone-Bannock Tribes of the Fort Hall Reservation
- Sisseton-Wahpeton Oyate Tribes
- Standing Rock Sioux Tribe
- Ute Indian Tribe of the Uintah and Ouray Reservation
- Yankton Sioux Tribe

1.8.2.3 Wyoming State Agencies

- State of Wyoming Office of the Governor (and the following associated departments)*
    - State of Wyoming Administration
    - State of Wyoming Department of Agriculture Natural Resources and Policy Division
    - State of Wyoming Department of Revenue
    - WYDOT
    - State of Wyoming Game and Fish Department (WGFD)
    - State of Wyoming State Geological Survey (WSGS)
    - State of Wyoming Governor's Policy Office
    - State of Wyoming Industrial Siting Division
    - State of Wyoming Land Quality Division
    - State of Wyoming Office of State Lands and Investments
    - SHPO
    - State of Wyoming State Parks, Historic Sites, and Trails
    - State of Wyoming Travel and Tourism
    - State of Wyoming Water Quality Division

1.8.2.4 Local Governments

- Fremont County, Wyoming*
- Lincoln County, Wyoming Commissioners*
- Sublette County, Wyoming*
- Sweetwater County, Wyoming*
- Natrona County, Wyoming*
- Natrona County Conservation District*
- Popo Agie Conservation District*
- Sublette County Conservation District*
- Sweetwater County Conservation District*
- Dubois-Crowheart Conservation District
- Lower Wind River Conservation District
- Medicine Bow Conservation District
- Saratoga-Encampment-Rawlins Conservation District
- Carbon County, Wyoming
- City of Green River, Wyoming
- City of Rock Springs, Wyoming
- City of Rawlins, Wyoming
- City of Riverton, Wyoming
- Town of Big Piney, Wyoming

- Town of Granger, Wyoming
- Town of Hanna, Wyoming
- Town of LaBarge, Wyoming
- Town of Lander, Wyoming
- Town of Marbelton, Wyoming
- Town of Medicine Bow, Wyoming
- Town of Pinedale, Wyoming
- Town of Sinclair, Wyoming
- Town of Superior, Wyoming
- Town of Wamsutter, Wyoming

The BLM formed an Agency Interdisciplinary Team, including all cooperating agencies, that meets at key milestones to discuss the status of the Project and any issues needing agency input.

The BLM initiated consultation with the USFWS under Section 7 of the ESA and with the Wyoming SHPO under Section 106 of the NHPA of 1966 that can be conducted concurrently and integrated with the EIS. Also as part of government-to-government tribal consultation and in accordance with Section 106 of the NHPA, the BLM contacted Native American tribes that may have an interest in the Project area to initiate consultation on this Project.

The consulting agencies and coordinating parties will actively participate in Project meetings; assist in identification and resolution of issues; and review and comment on documents in accordance with the Project schedule. A more detailed description of the consultation and coordination efforts is provided in Chapter 5 – Consultation and Coordination.

1.8.3 Issues Addressed

The issues identified from scoping were used to identify, refine, and evaluate alternative routes and to direct the level of effort needed for the environmental resource studies. Based on review of the scoping comment letters and comment forms, the BLM identified the key issues listed below in Table 1-3. These issues were evaluated in detail during the environmental review of the Project and are addressed in the EIS (BLM 2014a).

Table 1-3
Concerns and Issues Raised by the Public and Government Agencies

Issue	Section(s) of the EIS Where Addressed[1]
Air Quality (Including Greenhouse Gas Emissions and Climate Change)	
Assess potential for additional impacts on the Upper Green River Basin (UGRB) marginal ozone nonattainment area	4.3.1, 4.4.2
Provide documentation of conformance with Wyoming General Conformity Requirements in the UGRB marginal ozone nonattainment area	4.3.1
Assess potential impacts due to emissions of criteria and HAPs	4.3.1.1
Assess potential emissions of H_2S	4.3.1.6
Assess potential impact on air quality related values (AQRVs) in Class I and sensitive Class II areas	4.3.1.6
Develop mitigation measures if impacts on air quality or AQRVs are predicted	4.3.1.6
Develop mitigation measures for dust suppression	4.3.1.6
Provide estimates of greenhouse gas (GHG) emissions and assessments of potential direct and indirect impacts of GHG emissions	4.3.1.9
Address ongoing and projected regional climate change in the Project area	4.3.1.9, 4.4.2
Assess the cumulative air quality impacts of the Project during construction, operation, and reclamation	4.4.2, 4.3.1

Table 1-3 Concerns and Issues Raised by the Public and Government Agencies	
Issue	**Section(s) of the EIS Where Addressed[1]**
Include emissions from the Normally Pressured Lance Project, the LaBarge Platform Project, and potentially the Bird Canyon Project; consider in the cumulative impact analysis	4.3.1, 4.4.2
Cultural Resources and National Historic Trails	
Assess potential direct and visual impacts on National Historic Trails (NHT)	4.3.2, 4.3.7, 4.4.8
Avoid impacts on historic and cultural resources in the Big Sandy Foothills, the Jack Morrow Hills, and the Teakettle Dune Field	4.3.2
Identify and evaluate alternative routes or route variations that would avoid NHTs	4.3.7, 4.4.8
Identify and evaluate alternative routes or route variations that avoid cultural resources	4.3.2, 4.4.3
Provide appropriate environmental mitigation measures for historic properties and NHTs	4.3.2.4, 4.3.7.4
Fish (Including Aquatic Resources)	
Assess the potential for water quality impacts that could negatively affect fisheries, particularly for the Colorado River cutthroat trout and wild trout	4.3.3
Assess alternative routes that minimize the impacts on trout	4.3.3
Minimize the input of fine sediments into waterbodies containing populations of native trout and waterbodies suitable for the expansion and reintroduction of native trout and other cold water fish species	4.3.3
Assess the potential to disseminate aquatic invasive species (AIS) and aquatic nuisance species (ANS) in waterbodies during Project construction, operation, and maintenance	4.3.3
Provide appropriate environmental mitigation measures for aquatic resources	4.3.3.4
Mineral and Energy Development	
Evaluate whether meeting the purpose of the Project would affect other oil and gas producers in Wyoming using EOR methods for production	4.3.4
Evaluate whether the Project would facilitate increased oil and gas production or exploration and address any associated potential impacts	4.3.4.
Include the Normally Pressured Lance Project, the LaBarge Platform Project, and potentially the Bird Canyon Project in the cumulative impacts analysis	4.4.5
Land Use Plan Conformance and Relationships to Policies, Plans, and Programs	
Determine whether the Project would be consistent with objectives of the Jack Morrow Hills RMP and Coordinated Activity Plan and the Green River ROD	4.3.5, 4.3.16
Require that the Applicant obtain and comply with the stipulations of all required permits	1.5, 1.6
Determine whether the Project would be consistent with the objectives of the ROD and Approved RMP Amendments (ARMPA) for the Rocky Mountain Region, including the Greater Sage-Grouse Sub-Regions	4.3.25
Livestock Grazing	
Assess the potential impacts on livestock grazing	4.3.6, Appendix E
Apply proper riparian grazing management strategies to disturbed stream banks	4.3.6.4, 2.2.8,
Incorporate measures to avoid establishment of non-native invasive plant species	4.3.6.4, 2.2.8,
Work with livestock permittees during the construction of the pipeline across lands grazed and traversed by livestock and develop and mandate mitigation measures	4.3.6.4, 2.2.8,
Native American Concerns	
Avoid impacts on cultural and natural resources of Native American concern	3.2.8, 4.3.8, 4.4.9
Provide appropriate environmental mitigation measures for the Green River pipeline crossing	4.3.8.4
Avoid impacts on the Boars Tusk, White Mountain Petroglyphs Area of Critical Environmental Concern (ACEC), the Cedar Ridge TCP, and the Chimney Butte landscape	3.2.8, 4.3.8, 4.4.9

Table 1-3 Concerns and Issues Raised by the Public and Government Agencies	
Issue	**Section(s) of the EIS Where Addressed[1]**
Avoid impacts from Project construction, operation, and maintenance on TCPs or sites with potential traditional or spiritual importance to tribes	3.2.8, 4.3.8, 4.4.9
Identify and evaluate alternative routes or route variations that avoid cultural and natural resources of Native American concern	3.2.8, 4.3.8, 4.4.9
Provide appropriate environmental mitigation measures for resources of Native American concern	4.3.8.4
Site confidentiality (e.g., human remains burial sites)	3.2.8, 4.3.8, 4.4.9
Public Health and Safety	
Assess the potential for inadvertent pipeline releases, including the frequency and volume of such releases	4.3.12
Describe the Project's leak detection systems, including the period of time a leak may occur prior to detection and control and the potential volume released prior to shutdown of the system	4.3.12
Consider incorporating the State of Wyoming guidance regarding leak detection and repair of oil and gas facilities in the UGRB ozone non-attainment area into the Project	2.2.1, 4.3.12
Provide the chemical characteristics of the liquid H_2S stream	3.2.12
Provide the anticipated fate and transport of any inadvertent release into the environment, including anticipated volatilization rates and resulting toxicity hazard	3.2.12, 4.3.12
Assess the potential impacts on public health and safety in areas where H_2S is transported, removed, and/or re-injected	4.3.12
Provide requirements for spill prevention and emergency response	Appendix A
Recreation	
Assess the impact on hunting due to imposed restrictions associated with the Project	4.3.13
Avoid creating hunting mitigation areas that are distant from existing hunting areas	3.2.13, 4.3.13
Avoid the introduction of noxious weeds and invasive plant species within areas used for recreation	4.3.13, 4.3.18
Socioeconomics	
Assess the potential for land devaluation due to the presence of a pipeline transporting H_2S	4.3.14
Assess the overall availability of CO_2 in the region and the quantities available for other projects	4.3.14
Evaluate whether the Project would facilitate increased oil and gas production or exploration and any associated economic impacts	4.3.4, 4.3.14
Assess the economic impacts on any other businesses and the overall economy of Wyoming, including companies conducting EOR within established oil fields	4.3.14
Environmental Justice	
Determine whether there are any environmental justice communities that would be affected by the Project and assess the potential for impacts on those communities	4.3.14.5
Address the potential cumulative environmental impacts on the health of any affected environmental justice communities and determine if the impact is disproportionately high	4.3.14.5
Special Designations (Including Area[s] of Critical Environmental Concern and Wilderness Study Areas)	
Identify and evaluate route options that avoid the Big Sandy Foothills, the Jack Morrow Hills, and other wilderness areas and Wilderness Study Areas (WSA) consistent with the FLPMA mandate that the BLM manage public lands for multiple-use and sustained yield	4.3.2, 4.3.16
Identify and evaluate route options that avoid and are distant from existing BLM ACECs	4.3.2, 4.3.16, 4.4.3, 4.4.17

Table 1-3 Concerns and Issues Raised by the Public and Government Agencies	
Issue	**Section(s) of the EIS Where Addressed[1]**
Vegetation (Including Invasive Species and Noxious Weeds)	
Develop procedures to minimize vegetation disturbance	4.3.18
Use topsoil segregation methods during construction and replace the topsoil during reclamation	4.3.15, 4.3.18
Avoid vegetation clearing along stream banks	4.3.21, 4.3.18
Provide a reclamation plan in the Draft EIS, and assess the plan prior to implementation, in coordination with the WGFD, the University of Wyoming, and the Sweetwater County Conservation District	4.3.15, 4.3.18
Develop procedures to minimize the dissemination and establishment of noxious weeds and invasive species	4.3.18
Consider requiring the use of native plant species that are preferred browse species of pronghorn and mule deer for reseeding disturbed areas	4.3.18
Consider creating irregular-shaped permanent rights-of-way to maximize the edge effect	4.3.18
Establish preconstruction habitat reference sites	4.3.18
Use native species for reclamation	4.3.18
Assess the approach to and timing of post construction reclamation	4.3.18
Monitor reclamation to check for erosion, weed infestation, and establishment of invasive species and to determine the success of reclamation	4.3.18
Maintain reclamation monitoring information in a single database	4.3.18
Require the creation of a remediation fund that can be used to mitigate impacts through offsite mitigation and restoration of native habitats along the pipeline corridor	4.3.18
Provide appropriate environmental mitigation measures for vegetation	4.3.18
Visual Resources	
Assess potential impacts on visual quality near Class I and Class II areas	4.3.19, Appendix D
Assess potential impacts on visual quality near NHTs	4.3.19, Appendix D
Assess potential impacts on visual resources for recreational users and landowners in the Project area	4.3.19, Appendix D
Assess visual impacts using the BLM Visual Resource Management (VRM) methods	4.3.19, 4.4.20, Appendix D
Water Resources (Including Groundwater and Surface Water)	
Identify the use of and evaluate the impacts on surface water and groundwater and associated aquifers	4.3.20, 4.3.21
Evaluate the impacts on scarce drinking water supplies and impaired waterbodies	4.3.20, 4.3.21
Evaluate the impacts on ground and surface water, including the nature of the impacts and the specific pollutants that would cause the impacts	4.3.20
Implement procedures to minimize the potential to introduce AIS and ANS	4.3.3, 4.3.20
Consider requiring the use of the horizontal directional drilling (HDD) installation method to cross all perennial, ephemeral, and intermittent streams and rivers	4.3.3
Avoid routing through riparian areas whenever practicable	4.3.20
Identify and evaluate alternative methods for stream crossings	4.3.20
Limit the removal of streamside vegetation and monitor reclamation of streamside areas for 5 years	4.3.20
Provide appropriate environmental mitigation measures for water resources	4.3.20
Wetlands and Riparian Areas	
Identify wetland areas, habitat types, and functions that could be affected by the Project and assess impacts on those wetlands	4.3.21
Consider requiring the use of the HDD installation method to cross all wetlands	4.3.20
Avoid routing through riparian areas whenever practicable	4.3.21

Table 1-3 Concerns and Issues Raised by the Public and Government Agencies	
Issue	**Section(s) of the EIS Where Addressed[1]**
Implement procedures to minimize the potential to introduce AIS and ANS	4.3.21
Limit the removal of streamside vegetation and monitor reclamation of streamside areas for 5 years	4.3.21
Assess the cumulative impacts of erosion and sedimentation on wetlands	4.3.21
Provide appropriate environmental mitigation measures for wetlands and riparian areas	4.3.20, 4.3.21
Wildlife	
Assess the potential impacts on big game migration routes	4.3.23
Avoid or minimize impacts on big game habitat and hunting areas	4.3.23
Avoid or minimize impacts on wildlife migration corridors, including identifying any alternative routes that would avoid the Red Desert to Hoback mule deer migration corridor	4.3.23
Assess the potential for impacts on greater sage-grouse using the Density Disturbance Calculation Tool (DDCT)	4.3.23
Coordinate with the WGFD to avoid conflicts between construction activities and pronghorn migration along the three pronghorn migration routes in the Pinedale District	4.3.23
Consider adhering to the governor's executive order regarding sage-grouse, including the restrictions for core and non-core areas	4.3.23
Consider requiring the use of native plant species that are preferred browse species of pronghorn and mule deer for reseeding disturbed areas to offset any resulting loss or fragmentation of big game habitat	4.3.23
Consult with the USFWS to identify required raptor nest avoidance times	4.3.23
Identify and evaluate alternative routes that have fewer potential impacts on wildlife habitat	4.3.23
Provide appropriate environmental mitigation measures to avoid, minimize, or reduce over time project effects on wildlife resources	4.3.23
Special Status Wildlife Species	
Assess the impacts on greater sage-grouse using the DDCT and including consideration of the known active leks within 0.6 mile of the proposed route	4.3.23, 4.4.24
Consider requiring that construction only be permitted at least 2 miles distant from each greater sage-grouse lek in non-core areas	4.3.23
Provide stipulations to protect unknown greater sage-grouse leks encountered during construction	4.3.23
Prohibit construction between March 15 and June 30 in greater sage-grouse core areas	4.3.23
Coordinate greater sage-grouse assessments with WGFD	4.3.23
Consider adhering to the governor's executive order regarding sage-grouse, including the restrictions for core and non-core areas	4.3.23
EIS Preparation and General Comments	
Establish a local working group of agencies and other stakeholders, including knowledgeable members of the public	5.2
Identify and assess alternatives to the Project based on the BLM's purpose and need to select the least environmentally impactful pipeline route, with minimal impacts on wildlife, scenic, and historical values	2.2.10
Provide clear maps of the proposed route, rights-of-way it would follow, key landmarks, and other information important to understanding the potential impacts of the Project	Volume II
Assess the direct, indirect, and cumulative impacts of the entire Project, including ancillary facilities	Chapter 4

Table 1-3 **Concerns and Issues Raised by the Public and Government Agencies**	
Issue	**Section(s) of the EIS Where Addressed[1]**
Evaluate the potential for the Project to facilitate increased oil and gas production or exploration and address any associated potential impacts	4.3.4
Include a section in the Draft EIS that summarizes all mitigation and control measures that will be implemented, including identification of the entity that will be requiring the mitigation	2.2.8
NOTE: [1]Sections providing background information that assists in understanding issues, concerns, and/or impacts are listed in this column.	

THIS PAGE INTENTIONALLY LEFT BLANK

Chapter 2 – Proposed Action and Alternatives

Chapter 2 – Proposed Action and Alternatives

2.1 Introduction

Chapter 2 describes the Proposed Action to accommodate the Applicant's proposal to construct and operate the Project, including the underground CO_2 pipeline system and Riley Ridge Sweetening Plant, the 230kV transmission line, injection wells, and ancillary facilities. This chapter also includes the (1) Project description, (2) alternatives to the Proposed Action and their development, (3) a summary comparison of alternative routes, and (4) the Agency Preferred Alternative. This chapter is organized in the following sections:

- 2.2 – Proposed Action: describes the Applicant's Proposed Action; the typical characteristics of the pipeline system and Riley Ridge Sweetening Plant, the 230kV transmission line, injection wells, and ancillary facilities; and anticipated activities for construction, operation, and maintenance, including design features of the Proposed Action for environmental protection
- 2.3 – Alternatives: describes the pipeline alternative-route locations that could accommodate the pipeline system evaluated in this EIS and the alternative of taking no action, the development of pipeline route alternatives, and alternatives considered but eliminated from detailed study with discussion of the reasons for their elimination
- 2.4 – Comparison of Alternatives: summarizes the results of the process of screening and comparing the pipeline alternative routes and identifies the Agency Preferred Alternative.

2.2 Proposed Action

The Proposed Action consists of the following Project components:

- An underground non-gaseous H_2S/CO_2 pipeline from the existing Riley Ridge Treating Plant (a CH_4 and helium [He] recovery facility) to the proposed Riley Ridge Sweetening Plant, consisting of approximately 31 miles of 16-inch-diameter pipe in Sublette County;
- A CO_2 underground pipeline from the proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect, consisting of approximately 129 miles of 24-inch-diameter pipe, and continuing from the interconnect another approximate 84 miles to the terminus at the Natrona Hub in Natrona County;
- The 4.3-acre proposed Riley Ridge Sweetening Plant, located on BLM-administered lands, would be constructed and operated to separate the CO_2 from the H_2S; the H_2S would be reinjected into deep geologic formations via two injection wells proposed for drilling;
- An approximately 1-mile-long 230kV overhead transmission line that would bring power to the Riley Ridge Sweetening Plant from an existing 230kV transmission line; and
- Ancillary facilities, such as roads, valves, flowlines, etc.

The first component of the Project is the 16-inch non-gaseous H_2S/CO_2 pipeline, which would begin at the existing Riley Ridge Treating Plant and extending southeast to the proposed Riley Ridge Sweetening Plant. The gas from the existing Riley Ridge Treating Plant is a mixture of H_2S and CO_2, which would be converted from a gaseous state at extraction to a non-gaseous state for transport to the proposed Riley Ridge Sweetening Plant.

The second component of the Project is the proposed Riley Ridge Sweetening Plant. This facility would be constructed and operated to separate the CO_2 from the H_2S and the H_2S would be reinjected into a deep

geologic formation via two proposed injection wells. The CO_2 would be stored temporarily onsite and then be transported from the area via a 24-inch CO_2 pipeline. The proposed Riley Ridge Sweetening Plant is a 4.3-acre facility located on BLM-administered lands. A new transmission line would be needed to supply energy to the Riley Ridge Sweetening Plant. PacifiCorp (in coordination with Denbury) would construct an approximately 1-mile-long 230kV transmission line, with tower structures from 70 to 100 feet high to bring power from an existing PacifiCorp 230kV transmission line (located south of the proposed facility).

The third component of the Project is the 24-inch CO_2 pipeline, which would transport CO_2 from the Riley Ridge Sweetening Plant east to the Greencore Pipeline. Initially, the pipeline would travel east through southern Sublette County crossing into northern Sweetwater County. It would continue southeast across Bush Rim and into the Red Desert and then turn northeast until it reaches the Bairoil Interconnect about 50 miles northwest of Rawlins, Wyoming. From the Bairoil Interconnect, the pipeline would travel northeast through Fremont County along the BLM's designated pipeline corridor, turn east into Natrona County, and finally north to connect to the Greencore CO_2 Pipeline, approximately 30 miles west of Casper, Wyoming. Two sources of CO_2 would be connected to the pipeline. The first CO_2 source would be the CO_2 being transported from the Riley Ridge Sweetening Plant produced from the Riley Ridge Treating Plant and associated wells. The second source would be from the existing Shute Creek Gas Plant that would be delivered to The Applicant at the Bairoil Interconnect site near Bairoil, Wyoming, via the Bairoil/Dakota pipeline.

The Riley Ridge Treating Plant in the Riley Ridge Unit was completed and became operational in December 2013. Unit wells produce sour gas from the Madison Formation, consisting of CO_2, nitrogen gas (N_2), CH_4, He, and H_2S. The Riley Ridge Treating Plant separates CH_4 and He for sale, and pending permitting and construction of the pipeline, the remaining gas (CO_2 and H_2S) is injected into a unit disposal well. The Riley Ridge Treating Plant is capable of processing 200 million cubic feet per day (MMcf/d) of gas from wells primarily comprising CO_2, N_2, CH_4, He, and H_2S. Currently, the Riley Ridge Treating Plant can process 100 MMcf/d but has potential for increased capacity. Nearly all CO_2 and H_2S is extracted and injected back into the producing reservoir as a liquid, while much of the N_2 is vented into the atmosphere. If the Project is approved, non-gaseous CO_2/H_2S would be pumped through the proposed non-gaseous H_2S/CO_2 pipeline, terminating at the Riley Ridge Sweetening Plant where the CO_2 and H_2S would be separated.

As proposed, the pipeline is sized to allow for potential transport of future CO_2 sources.

The CO_2 that is transported via the proposed pipeline to the Greencore Pipeline would be used at the Bell Creek Field and other oilfields in southeastern Montana for EOR. CO_2 would be injected into subsurface oil-bearing formations to enhance oil production from existing and depleted oil wells. Once injected, the CO_2 would remain stored underground unless it is produced with recovered oil. Produced CO_2 is captured, separated from the oil at the surface, and reinjected back into the oil recovery process again. Upon ultimate depletion of the field, the CO_2 would effectively remain stored in place.

2.2.1 Proposed Facilities

This section summarizes the proposed facilities. More detailed information is presented in the Applicant's POD (refer to Appendix A).

2.2.1.1 Underground Non-Gaseous H_2S/CO_2 Pipeline

The non-gaseous H_2S/CO_2 pipeline would begin at the existing Riley Ridge Treating Plant (located on land administered by the State of Wyoming) at Milepost (MP) 0.0 in Township 29 North (T29N), Range

114 West (R114W), Section 16, in Sublette County, Wyoming. This pipeline would then head southeast where it would terminate at the proposed Riley Ridge Sweetening Plant located in Section 1, T27N, R111W, in Sublette County.

The Applicant is requesting a 50-foot-wide permanent right-of-way for the H_2S/CO_2 pipeline and an additional 25-foot-wide temporary right-of-way, for a nominal 75-foot wide construction right-of-way. Both of these rights-of-way would be reclaimed after construction (i.e., 75-foot-wide temporary disturbance).

Additional temporary work spaces (ATWS) would be needed in certain locations along the pipeline where terrain or other features require more room to work. Typically, these ATWS would be 40 feet wide in addition to the 25-foot-wide temporary right-of-way (i.e., 40 feet wide by 150 feet long for road crossings; 40 feet wide by 200 feet long for stream crossings; and 40 feet wide by 300 feet long for spoil storage) (refer to Section 2.2.1.3); however, the dimensions could vary based on sight-specific conditions such as slope. The total width of the right-of-way during construction (i.e., including the ATWS) could vary between 75 feet and 115 feet. Unless otherwise directed by the BLM or landowner, the temporary right-of-way and the ATWSs would be stripped of vegetation and topsoil (note: topsoil would be stored for reuse post pipeline installation).

The Applicant plans to construct this portion of the Project as a single construction spread working from west to east from the Riley Ridge Treating Plant to the Riley Ridge Sweetening Plant. Where directed by the BLM, portions of the pipeline would closely parallel existing utilities offset from buried utilities by 25 feet (centerline to centerline) to avoid or minimize resource conflicts.

The 16-inch non-gaseous H_2S/CO_2 pipeline would be designed in accordance with USDOT Pipeline Safety Regulations, 49 CFR 192. The pipe would be steel line pipe conforming to American Petroleum Institute (API) 5L and made from Grade X-70, high-strength steel. Special design consideration would be given to road crossings, river crossings, and any areas with potential for class location change that would require heavier wall pipe (criteria which would be specified in the approved POD). The pipeline would initially have a uniform design maximum allowable operating pressure of 2,200 pounds per square inch (psi) gauge throughout, and would be capable of transporting 600 MMcf/d of H2S/CO2 of product.

2.2.1.2 Riley Ridge Sweetening Plant

The non-gaseous H_2S/CO_2 product would be sent to the Riley Ridge Sweetening Plant via the 16-inch pipeline for processing. The product is composed of a blend of 91 percent CO_2 and 7 percent H_2S. The remaining 2 percent includes carbonyl sulfide, methanol, CO_2, and propane. The processing at the Riley Ridge Sweetening Plant is designed to produce clean CO_2. At full operation, it is expected that the Riley Ridge Sweetening Plant would receive a feed stream of 150 MMcf/d; it would produce approximately 135 MMcf/d of EOR grade CO_2 and 15 MMcf/d of enriched H_2S. The clean CO_2 would be transported via the 24-inch pipeline. The H_2S and other components would be reinjected via the injection wells located at the Riley Ridge Sweetening Plant. Nitrogen gas would be separated during processing at the Riley Ridge Sweetening Plant and sent to the onsite flare. The Riley Ridge Sweetening Plant would consist of three towers designed to facilitate processing of the gases (approximately 200 feet tall), and two H_2S injection wells located within an 80-acre area at T27N, R111W, Section 1, SE¼ SW¼ of NE¼. The plant facility would require 4.3 acres (330 feet by 565 feet) and an additional 11.3 acres for a temporary construction laydown yard, for a total of estimated ground disturbance of 15.6 acres. Also, the approximately 1-mile-long overhead 230kV transmission line with structures from 70 to 100 feet tall would be constructed south of the Riley Ridge Sweetening Plant location (refer to Section 2.2.1.9).

2.2.1.2.1 Hydrogen Sulfide Injection Wells

The two acid gas H_2S injection wells (the Chapel Canyon 1-31 and 1-44; refer to Section 2.2.1 and Appendix B of the Applicant's preliminary POD [note: the preliminary POD is included as Appendix A of this EIS]) would be located at T27N, R111W, Section 1, NW¼ NE¼ and SE¼. Each well pad would total 3.9 acres in size (700 feet and 400 feet). The drilling and operation of these approximately 20,000-foot deep injection wells would be regulated by the Wyoming Oil and Gas Conservation Commission (WOGCC) which has primacy under the Safe Drinking Water Act, UIC Program for Class II injection wells. Both injection wells would be drilled utilizing a closed loop system to manage solids in the drilling fluids, with no open reserve pits. Additionally, both injection wells would be constructed with multiple protective cement sleeves and liners to protect shallow and deep aquifers as required by the UIC program. Operational and well integrity reporting requirements would be conducted in accordance with the conditions set forth in the Class II injection permit issued by the WOGCC.

The casing and cementing program for the injection disposal wells has been designed to be protective of shallow, potentially useable aquifers in the area. The WOGCC would review the Applicant's design prior to issuing a permit to drill. At the start of the well, a 26-inch-diameter conductor pipe would be set at a nominal depth of 100 feet (Figure 2-1). The conductor pipe is designed to provide a retainer to support loose, unconsolidated materials and is not usually cemented in place. The first casing string or surface casing is proposed to be set at a nominal depth of 2,000 feet true vertical depth (TVD). Actual surface casing depth would be directed by the authorizing agency depending upon the determination of adequate groundwater protection depth since it is possible that potentially useable water zones may be present at depths greater than 2,000 feet. The surface casing is not only used to protect groundwater resources, but also anchors the well in place to support additional casing strings.

To achieve those objectives, the cement would be circulated from the bottom of the hole at the casing point to the ground surface. If cement does not adequately circulate to the surface, remedial cementing by topping out from the surface would be conducted. The surface string would consist of 16-inch, API high-strength grade casing. The next casing string would be the first intermediate casing, which is proposed to be set at a nominal depth of 15,000 feet TVD and consist of 10.75-inch, combination of API high-collapse strength/high-strength grade casing. The purpose of the first intermediate casing would be to protect permeable zones from 15,000 feet to 2,000 feet to include the Nugget Sandstone and potential hydrocarbon-bearing zones. The cementing program of the first intermediate casing string would provide additional protection of potentially useful groundwater zones since the cement for the first intermediate string would be cemented in two stages.

The first stage of cement would cover the casing from the setting depth of 15,000 feet to approximately 7,500 feet to cover and prevent leakage from possible hydrocarbon zones in the Frontier Formation. The second cement stage would be accomplished through use of a diverter valve tool set at 7,000 feet through which cement would be pumped to cover an interval from 7,500 to top of cement (TOC) at 1,500 feet. The TOC at 1,500 feet would be well above the surface casing depth. The cementing of possible up-hole hydrocarbon zones and the proposed TOC of 1,500 feet would provide extra protection of potential useable aquifers in addition to the surface casing.

Because of the depth of the wells and the severe conditions that are expected based on the experience of drilling deep wells on the LaBarge Platform, the second intermediate casing would consist of a nominal 7.58-inch casing set from approximately 16,400 feet TVD to surface with heavy wall casing from 16,400 to 15,000 feet. The second intermediate casing would be cemented with a TOC of 13,000 feet. The heavy wall casing would be set through the Thaynes Formation, which has salt zones that present well integrity and drilling problems.

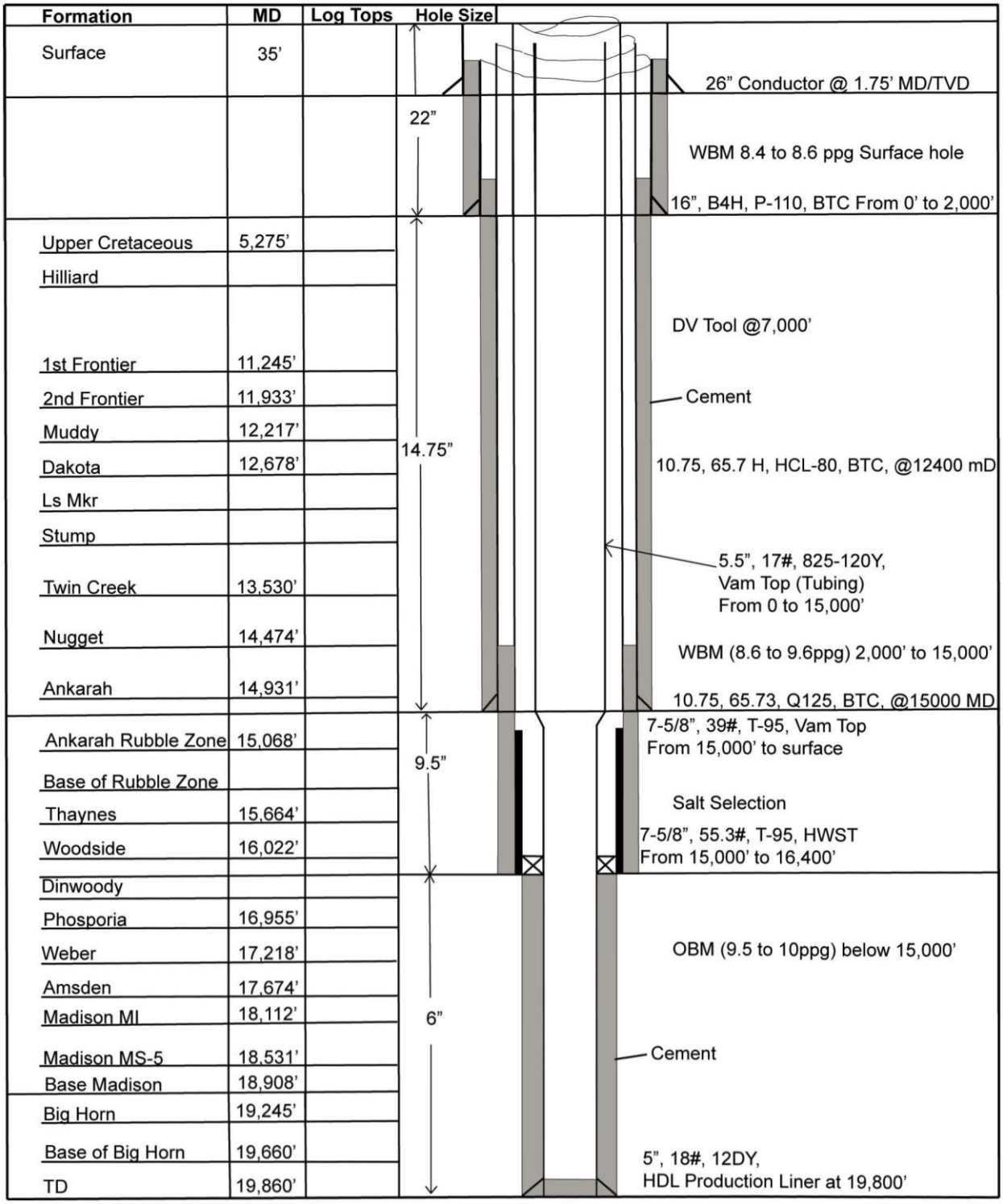


Figure 2-1 Acid Gas Disposal Well Construction Diagram

A production liner would be set to an expected total depth of approximately 19,900 feet. The potential Madison and Big Horn disposal zones may be encountered between approximately 17,700 and 19,700 feet TVD. The 5-inch production liner would be set at total depth and cemented to the bottom of the second intermediate casing using acid-resistant cement. The Madison Limestone and Big Horn Dolomite

would be encountered at depths 3,600 to 4,300 feet below the Riley Ridge Unit wells because the proposed injection disposal wells are located 12 to 15 miles down dip on the east flank of the LaBarge Anticline structure.

Casings would be cemented to achieve competent cement to the agency-approved cement tops. Cement jobs would be evaluated or tested according to rule or agency direction. If evaluation of cement indicates insufficiency of a cement job in the opinion of the WOGCC, then remedial cementing would be conducted in accordance with agency direction and approval.

2.2.1.3 Underground CO_2 Pipeline

The CO_2 pipeline would begin at the Riley Ridge Sweetening Plant at MP 30.4 in Section 1, T27N, R111W in Sublette County, Wyoming. The Riley Ridge to Bairoil Interconnect portion of the Project would head east and then southeast into Sweetwater County, then northeast into Fremont County where it would intersect the Bairoil Interconnect and access Exxon's Shute Creek CO_2 pipeline at MP 159.2. The pipeline would then continue north and east into Natrona County and then north to the Natrona Hub where it interconnects with the Greencore Pipeline. The CO_2 pipeline would terminate at MP 242.7 in T35N, R85W, Section 12, in Natrona County. The pipeline is planned to operate below 2,220 psi, maximum operating pressure. The minimum operating pressure to ensure the CO_2 remains in the dense phase (liquid) is 1,200 psi. The CO_2 pipeline would be capable of delivering a maximum of 600 MMcf/d of gas to the Exxon Interconnect and hence to the Natrona Hub.

The Applicant is requesting a 50-foot-wide permanent right-of-way for the CO_2 pipeline, and an additional 50-foot-wide temporary right-of-way, for a nominal 100-foot wide construction right-of-way. Both rights-of-way would be reclaimed after construction (i.e., 100-foot-wide temporary disturbance).

ATWSs may be needed at locations where terrain or other features require more room to work. The CO_2 pipeline would closely parallel existing pipelines and would be offset 50 feet (centerline to centerline) per the Interstate Natural Gas Association of America-recommended standards for pipelines of 12-inches in diameter or larger. Where directed by the BLM, a 25-foot offset would be utilized or the right-of-way width would be "necked down" due to avoid or minimize impacts on sensitive areas or resources (e.g., known cultural sites, raptor nests).

The Applicant plans to construct the CO_2 pipeline in several construction spreads to optimize use of construction windows and to complete the Project as soon as possible.

2.2.1.4 Pig Launcher and Receiver Facilities

Pig launchers and receivers are used for maintenance of pipelines without stopping the flow of the product. The pigs are sent through the pipeline using pressure from the launcher to the receiver to conduct cleaning and inspection. There would be an above-ground launcher at each delivery point and an above-ground receiver at each receipt point to allow for pigging operations. The locations and dimensions of the pig launcher/receiver (L/R) facilities are listed in Table 2-1. Refer to Figure 2-2 for details.

Table 2-1
Locations and Dimensions of Launcher/Receivers and Mainline Valves

Milepost	Facility Type	Facility Name	Dimensions (feet)	Acreage	Power	Landowner
0.0	L/R	Treating Plant L/R1	100 x 150	0.34	Electric distribution line	State of Wyoming
2.5	MLV	MLV 1	40 x 60	0.06	Electric distribution line	BLM
4.6	MLV	MLV 2	40 x 60	0.06	Electric distribution line	BLM
7.3	MLV	MLV 3	40 x 60	0.06	Electric distribution line	BLM
9.6	MLV	MLV 4	40 x 60	0.06	Electric distribution line	BLM
12.0	MLV	MLV 5	40 x 60	0.06	Electric distribution line	BLM
13.8	MLV	MLV 6	40 x 60	0.06	Electric distribution line	BLM
16.3	MLV	MLV 7	40 x 60	0.06	Electric distribution line	BLM
18.6	MLV	MLV 8	40 x 60	0.06	Electric distribution line	State of Wyoming
20.4	MLV	MLV 9	40 x 60	0.06	Electric distribution line	BLM
22.6	MLV	MLV 10	40 x 60	0.06	Electric distribution line	Private
24.7	MLV	MLV 11	40 x 60	0.06	Electric distribution line	BLM
27.3	MLV	MLV 12	40 x 60	0.06	Electric distribution line	BLM
29.3	MLV	MLV 13	40 x 60	0.06	Electric distribution line	BLM
30.4	L/R	Riley Ridge Sweetening Plant L/R1	100 x 150	0.34	Electric distribution line	BLM
50.4	MLV	MLV 14	50 x 75	0.09	Solar	BLM
64.3	MLV	MLV 15	50 x 75	0.09	Electric distribution line	BLM
73.2	MLV	MLV 16	50 x 75	0.09	Electric distribution line	BLM
86.7	L/R	L/R	100 x 150	0.34	Electric distribution line	BLM
106.3	MLV	MLV 17	50 x 75	0.09	Solar	State of Wyoming
126.2	MLV	MLV 18	50 x 75	0.09	Solar	BLM
142.7	MLV	MLV 19	50 x 75	0.09	Solar	BLM
159.7	L/R	Bairoil L/R1	100 x 150	0.34	Electric distribution line	BLM
159.7	MLV	Bairoil MLV1	50 x 75	0.09	Electric distribution line	BLM
170.0	MLV	MLV 20	50 x 75	0.09	Electric distribution line	Private
178.1	MLV	MLV 21	50 x 75	0.09	Electric distribution line	BLM
197.4	MLV	MLV 22	50 x 75	0.09	Electric distribution line	BLM
210.8	MLV	MLV 23	50 x 75	0.09	Electric distribution line	Private
223.9	MLV	MLV 24	50 x 75	0.09	Solar	Private
242.7	L/R	Natrona L/R1	100 x 150	0.34	Electric distribution line	Private
			Total	4.15		

NOTES:
[1]L/R and MLVs would be within the fenced boundary of the facility; there would be no additional ground disturbance at these locations.
MLV = mainline valve

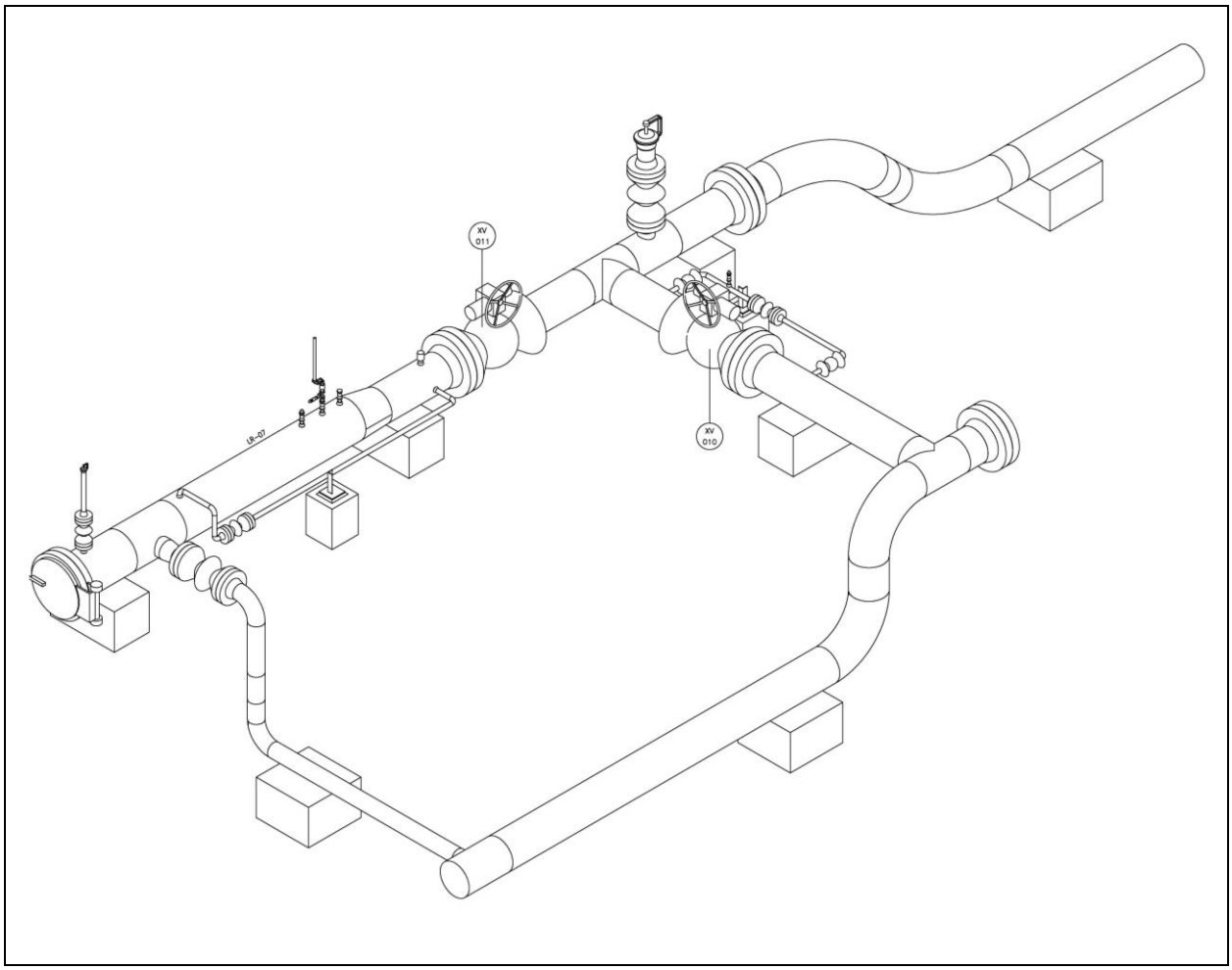


Figure 2-2 Typical Pig Launcher and Receiver Facility

2.2.1.5 Mainline Valves

Mainline valves are installed along the pipeline to help control the flow of product. A total of 24 above-ground MLVs would be installed at regular intervals along the pipeline and would be electric or solar powered. Most of the valves can be operated remotely. Valves on the non-gaseous H_2S/CO_2 pipeline would be located at approximately 2-mile intervals for an estimated total of 13 sites. The CO_2 pipeline would have valves located at approximately 20-mile intervals for an estimated total of 11 sites. For reference, Table 2-1 provides specific locations by MP, dimensions, and the landowner for each proposed facility. Fenced enclosures would be installed around each valve assembly. The fenced enclosures would be contained within the limits of the permanent rights-of-way.

Approximately 25 distribution lines would be needed to support the MLV, launchers, and receivers. In general, these distribution lines would be constructed on wooden monopoles (110/220 voltage power), and the towers would be approximately 35 feet high and spaced approximately every 250 feet. In many cases, access to a power drop would be available within or immediately adjacent to the pipeline right-of-way. However, if immediate access to a power drop is not available for the MLV, a solar power nitrogen actuation (via pressurized nitrogen bottles) would be used to power the MLVs or the distribution lines to the MLVs would be buried. Further, in areas with resources sensitive to the presence of overhead structures (e.g., greater sage-grouse Priority Habitat Management Area [PHMA], pygmy rabbit habitat) or to comply with management objectives (e.g., VRM Class II areas), a solar power nitrogen actuation (via

pressurized nitrogen bottles) would be used. Also, the Pinedale Field Office RMP (Objective 3 – Action h) stipulates that all new power lines would be buried to the extent practicable. The Applicant has committed to either burying any distribution lines to the MLVs in the Pinedale Field Office or powering the MLVs using solar power (in which case distribution lines would not be needed). Solar power nitrogen actuation would be about 50 feet by 75 feet (Table 2-1). These solar units would also be located inside the fenced boundary created for the MLVs and would not result in additional ground disturbance at these locations.

To be conservative in ground-disturbance calculations, ground-disturbance estimates (refer to Section 2.2.2) include the assumption that a distribution line would be required for all MLVs.

2.2.1.6 Meter Stations

The locations of the two meter stations are provided in Table 2-2.

Table 2-2
Meter Station Locations

Location Description	Milepost	County	Legal Description	Site Size (acres)
Riley Ridge Sweetening Plant	30.4	Sublette	T27N, R111W, Section 1, SWNE	4.3
Bairoil Valve Site	159.7	Fremont	T28N, R92W, Section 33, SWSW	5.0

2.2.1.7 Communication Facilities

An existing Supervisory Control and Data Acquisition (SCADA) control center located at Denbury's headquarters in Plano, Texas, would be utilized to monitor and control the Project operation. This control center would include a leak monitoring system. The SCADA leak detection communication sites would be located about every 4 miles along the pipeline route.

2.2.1.8 Access Roads

The Applicant proposes to use a combination of 164 existing public and private roads to gain access to the right-of-way during construction of the Project. The total combined length of these roads would be approximately 363 miles. Of these, approximately 75 miles (made up of 85 roads) would require improvement (i.e., blading or some sort of ground disturbance to be useable during construction). The remainder of access road miles (made up of 79 roads) would not require improvement. As proposed, no new access roads would be required for construction of the pipeline system.

Access roads that require improvements/widening would be returned to preconstruction condition, depending on landowner requirements. Access roads were determined to be improved or unimproved by the Applicant's interpretation (SWCA Environmental Consultants, Inc. [SWCA] 2014). Roads that were improved were typically composed of gravel surfaces and exhibited crowned and ditched characteristics.

Once a route is selected for construction, the POD would be revised to include a specific travel management plan for construction, operation, and maintenance that would include how seasonal and timing limitations and other mitigation measures would be managed. The revised POD would become a condition of the BLM's ROD and a stipulation of the BLM right-of-way grant, if offered.

Hauling equipment and materials would be done in accordance with state and local requirements. Unimproved access roads may be widened to 25 feet to accommodate construction equipment, unless specifically exempted from such widening by the landowner or administering agency. The 85 roads that require improvements range from existing 10- to 15-foot-wide roads (that would be widened to 25 feet) to

existing two-track roads. Survey stakes would be used to delineate the edges of the 25-foot-wide boundary for access roads that require improvements.

Access roads would receive dust abatement as described in the Fugitive Dust Control specific design features and agency-required mitigation measures (refer to Section 2.2.8). Following construction completion, roadways would be returned to as good or better condition than prior to construction. ATWS and staging areas associated with access roads would be reclaimed at the end of construction. Operations and maintenance activities could require year-round access post-construction.

2.2.1.9 230-Kilovolt Transmission Line

The proposed 230kV transmission line project is located entirely on BLM-administered lands in Sublette County, Wyoming. The 230kV transmission line would feed the proposed Riley Ridge Sweetening Plant Substation from the existing Chappel Creek-Jonah Field 230kV line (WYW-167195). The area of the permanent right-of-way would total about 21.4 acres. The proposed right-of-way for the transmission line is 150 feet wide (i.e., 75 feet on either side of center line). The switching station would comprise about 5 acres. Temporary right-of-way also would be required for conductor pulling and tensioning at each end of the transmission line totaling 2.6 acres.

The transmission line would be constructed with approximately eight wood two-pole H-frame structures between 70 to 100 feet high and spaced an average of 800 feet apart. The switching station would contain breakers, switches, bus work, steel dead-end poles, and a control house.

Construction would begin after a notice to proceed has been authorized and would last about 6 months. Construction of the transmission line is expected to occur in conjunction with the construction of the Project. The existing and proposed right-of-way and existing BLM roads would be used for construction access. Ground disturbance associated with the 230kV transmission line project is summarized in Table 2-3. Construction activities would occur in the following sequential order over the 6-month construction period:

- Preconstruction surveying and geotechnical analysis
- Right-of-way construction access and preparation
- Power line structure site preparation
- Borehole excavation
- Structure assembly and erection
- Conductor stringing and tensioning
- Cleanup and reclamation

Following construction, PacifiCorp would grade and/or reslope disturbed areas to their approximate original contours, where needed, to minimize erosion and visual alteration. If grading is needed to ensure the safe movement and operation of heavy equipment, these areas would be restored following construction. PacifiCorp would reclaim and revegetate areas where vegetation has been removed, destroyed, or damaged during construction. Reclamation procedures would be applied to disturbed areas, including any temporary access roads and other areas disturbed by the proposed Project activities.

2.2.2 Land Requirements

The design characteristics and the nominal construction areas for the proposed Project facilities are described in Table 2-3. Table 2-4 presents the estimated ground disturbance associated with the Project based on the information in Table 2-3. Figure 2-3 illustrates the disturbance associated with the proposed Project facilities.

Table 2-3 Design Characteristics of the Proposed Project Facilities	
Feature	**Description**
Non-Gaseous H_2S/CO_2 Pipeline (Segment 1)	
Pipeline diameter	16 inches
Material	Grade X-70, steel line pipe
Pipeline length	From 30.4 to 38.5 miles depending on the route selected
Land Temporarily Disturbed	
Construction right-of-way	75 feet (includes permanent right-of-way width plus an additional 25 feet)
Staging areas	3.8 acres of disturbance. Staging areas would be for temporary storage of equipment, vehicles, pipe sections, etc. at strategic locations along the right-of-way.
ATWS	21 acres of disturbance; needed at intervals where terrain or other features require more room to work (40 feet by 150 feet for road crossings, 40 feet by 200 feet for stream crossings, and 40 feet by 300 feet for spoil storage; dimensions would vary depending on site-specific conditions, such as slope)[1]
Distribution lines	From 22.7 to 28.7 acres of disturbance depending on route selected[2]
Land Permanently Disturbed	
Access roads[3]	Where approximately 3.9 miles of roads need to be improved/widened (approximately 7.1 acres of disturbance)[4]
Pig L/R sites[5]	Refer to Table 2-1
SCADA leak detection communication sites and inspection flow meters	6-foot by 6-foot sites (36 square feet) located approximately every 4 miles
MLV	About 13; 40 by 60 feet per site; located about every 2 miles
Pipe yards[6]	12.8 acres of new disturbance required for Glencoe Junction (2 yards); no new disturbance required for Big Piney yard [7]
CO_2 Pipeline (Segments 2 and 3)	
Pipeline diameter	24 inches
Material	Grade X-70 high strength steel line pipe
Pipeline length	From 202 to 238 miles depending on route selected
Land Temporarily Disturbed	
Construction right-of-way	100 feet (50-foot-wide permanent right-of-way plus 50-foot-wide temporary right-of-way)
Staging areas[8]	56.7 acres for temporary storage of equipment, vehicles, pipe sections, etc. at strategic locations along the right-of-way
ATWS	128.9 acres of disturbance; needed at locations where terrain or other features require more room to work (typically, 40 feet by 150 feet for road crossings; 40 feet by 200 feet for stream crossings; and 40 feet by 300 feet for spoil storage; dimensions would vary depending on site-specific conditions, such as slope)[1]
Distribution lines	From 24.1 to 25.3 acres depending on route selected[2]

Table 2-3 Design Characteristics of the Proposed Project Facilities	
Feature	**Description**
Land Permanently Disturbed	
Access roads	Where approximately 70 miles of roads need to be widened to 25 feet (approximately 127 acres); existing conditions range from two-track roads and 10- to 15-foot roads[3]
Pig L/R sites[5]	Refer to Table 2-1
SCADA leak detection communication sites and inspection flow meters	6-foot by 6-foot sites (36 square feet) located approximately every 4 miles
MLV	About 12; 50 by 75 feet per site; located about every 20 miles
Pipe yards	19.2 total acres of new disturbance required for Point of Rocks, Wamsutter, and Casper yards [7]
Other Project facilities	All proposed Project equipment, including scraper traps, block valves and takeoff valves, would be installed according to applicable requirements of 49 CFR, Part 195, Transportation of Hazardous Liquids.
Riley Ridge Sweetening Plant (including laydown yard)	
Distillation Towers (included in plant footprint)	3 towers each approximately 200 feet tall
Site	80 acres
Land Temporarily Disturbed	
Riley Ridge Sweetening Plant construction laydown yard	11.3 acres
H_2S acid gas injection wells and flowlines	2 wells; 4 acres temporary disturbance
Land Permanently Disturbed	
Riley Ridge Sweetening Plant footprint	330 feet by 565 feet (4.3 acres total)
H_2S acid gas injection wells and flowlines	2 wells; 7.9 acres permanent disturbance
Well pad access roads	2 roads, approximately 700 feet and 400 feet in total length; total 0.63 acres disturbance[9]
Bairoil valve site	5 acres
Electrical substation	1.4 acres permanent disturbance
Distribution Lines (associated with Underground Non-Gaseous H_2S/CO_2 Pipeline and CO_2 Pipeline)	
Tower type	Wooden, monopole (three phase; 110/220 voltage power)
Tower height	Approximately 35 feet
Tower spacing	Approximately 250 feet
230kV Transmission Line (Associated with Riley Ridge Sweetening Plant)[10]	
Tower type	Two-pole wood H-frame
Tower height	From 70 to 100 feet (average 90 feet)
Conductor size	1272 non-specular aluminum conductor steel reinforce; 1.345-inch diameter
Minimum conductor ground clearance	24 feet minimum
Circuit configuration	horizontal
Length of transmission line	Approximately 0.84 mile[11]
Tower spacing (average span)	800 feet (approximately 8 structures)
Land Temporarily Disturbed	
Access roads	Improvement of existing roads (assumption of 12 feet wide and 1.125 mile of access road per mile of transmission line) (approximately 0.95 mile of access roads at 12 feet wide)

Table 2-3 **Design Characteristics of the Proposed Project Facilities**	
Feature	**Description**
Pulling and tensioning sites	Temporary work area disturbance (1.3 acres at each end of the transmission line, totaling 2.6 acres)
Temporary work area at structures	Approximately 150 feet by 250 feet, totaling 13.7 acres
Land Permanently Disturbed	
Permanent right-of-way width	150 feet
Permanent disturbance per structure (approximately 3-foot-diameter for each of two holes)	14 square feet per structure; about 0.0026 acres total for 8 structures
Switching station	5-acre site; constructed to transfer power from the existing Chappel Creek-Jonah Field 230kV line to the newly constructed line to the Riley Ridge Sweetening Plant

NOTES:

[1]Because exact dimensions and locations of ATWSs are only known for the Applicant's Proposed Action pipeline alternative route, disturbance for ATWSs was calculated by extrapolating the disturbance associated with this pipeline route and applying to the other alternative routes. This was conducted by Project segment and was based on acres per mile.

[2]To provide a conservative estimate, calculation based on the assumption that 31 miles of distribution lines have poles at 250-foot spacing, with 400 square feet of temporary disturbance at each pole. Access roads assumed to be 8 feet wide, with 1.125 miles of access roads to every 1 mile of distribution line.

[3]Access roads that require improvements/widening could be returned to preconstruction condition, depending on landowner requirements. Also accounted for within the 75 miles of unimproved roads are 14 roads that were combinations of both improved and unimproved segments. Acreage disturbance was based on an additional 15-foot width of disturbance.

[4]135.67 acres of permanent or temporary disturbance between both pipelines. 75 miles (85 roads) need to be widened to 25 feet wide. (Existing conditions range from two-track roads and 10 to 15-foot roads)

[5]Valves and L/R would be installed within the permanent right-of-way; however, their disturbance is permanent, whereas the right-of-way would be temporary and reclaimed.

[6]Pipe yard and rail sidings total approximately 201 acres. Of this area, approximately 170 acres is within existing leveled and graveled areas (i.e., 100 percent previously disturbed ground). Therefore, approximately 31 acres of vegetation would be disturbed and, of this, less than 1 acre would be riparian/wetland.

[7]It is unknown how much disturbance occurs at Glencoe Junction and Point of Rocks yard/rail sidings (just the combined total is known), so pipe yards are not divided out by segment. New ground disturbance would occur on private land.

[8]The acreage of the Natrona Hub (10.2 acres) is included in the Staging Area totals. Of these 10.2 acres, 5 acres are previously disturbed.

[9]Assuming a width of 25 feet and no existing disturbance.

[10]All numbers for the 230kV transmission line are assumptions based on similar projects, except for the length of the transmission line. Typical numbers have not been provided by the Applicant.

[11]Based on geographic information system (GIS) calculations with available data received.

Table 2-4 **Summary of Estimated Ground Disturbance by Alternative Pipeline Route**				
Alternative Route	**Total Miles**	**Temporary Disturbance[1,4] (acres)**	**Permanent Disturbance[2,4] (acres)**	**Permanent Right-of-Way Reclaimed[3,4] (acres)**
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant				
1A: Proposed Action	30.4	371	21	192
1A Variation: Dry Basin Draw	33.4	374	21	194
1B: Dry Piney	34.5	415	23	218
1C: Figure Four	38.5	459	24	243
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect				
2A: Proposed Action	129.1	1,877	128	835
2B: Southern Route	136.2	1,976	133	880

Table 2-4
Summary of Estimated Ground Disturbance by Alternative Pipeline Route

Alternative Route	Total Miles	Temporary Disturbance[1,4] (acres)	Permanent Disturbance[2,4] (acres)	Permanent Right-of-Way Reclaimed[3,4] (acres)
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect				
3A: Proposed Action	83.2	1,276	54	527
3B: Lost Creek to Lost Cabin	73.0	1,124	48	462
3C: Lost Creek to Highway 20/26	101.4	1,547	64	642

SOURCE: Calculations in this table are derived from information provided in the Applicant's Project description.
NOTES:
[1]Temporary disturbance includes estimated area of disturbance associated with the temporary right-of-way, ATWSs, staging areas, temporary disturbance at the proposed Riley Ridge Sweetening Plant, temporary disturbance associated with the H_2S acid gas injection wells and flowlines, and temporary disturbance associated with the 230kV transmission line and distribution lines.
[2]Permanent disturbance includes the estimated area of disturbance associated with pipe yards, access roads outside of the permanent right-of-way, SCADA leak detection communication sites, MLVs, pig L/R sites, and the Riley Ridge Sweetening Plant and permanent disturbance associated with the H_2S acid gas injection wells and flowlines, the substation, 230kV transmission line and switching station, and the Bairoil Valve Site Interconnect.
[3]Permanent right-of-way reclaimed includes the portion of the permanent right-of-way for pipeline and 230kV transmission line that would be reclaimed after construction. The disturbance in the permanent right-of-way associated with the pig L/R sites, the SCADA communication sites, the Riley Ridge Sweetening Plant, MLVs, 230kV switching station, and Bairoil valve site are not included.
[4]Calculations include an additional 5 percent contingency.

The pipe yards would be used to store pipe prior to transport to the right-of-way. All but two of the pipe yards are located entirely on private property. A portion of the Point of Rocks (east) and Wamsutter Rail Siding areas are located on BLM-administered lands. However, no new ground disturbance is anticipated at these sites. The pipe storage yards that require new ground disturbance would be constructed on private lands located near Big Piney, Point of Rocks, Wamsutter, Glencoe Junction, and Casper, Wyoming. Pipe would be transferred to the yards via the Union Pacific Railroad or truck. There would be two yards in Segment 1 (Glencoe Junction Yard would require new disturbance while Big Piney Yard would not). There would be three yards in Segments 2 and 3 (Wamsutter Yard and Siding, Point of Rocks Yard, and Casper Storage Yard). Point of Rocks Yard would require new disturbance while Wamsutter Yard and Siding and Casper would not. Therefore, for all three segments, two of the proposed yards (Glencoe Junction and Point of Rocks Yard) would have disturbance totaling approximately 32 acres. After pipe unloading from rail cars, the pipe would be transported to the right-of-way by truck. The estimated number of trucks per day for pipe transport would be 5 to 6 during a 2-week pipeline stringing period. Staging areas would be for temporary storage of equipment, vehicles, pipe sections, etc. at strategic locations along the right-of-way. There are 22 planned staging areas: 16 planned on BLM-administered lands, 4 on private lands, and 2 planned on state lands.

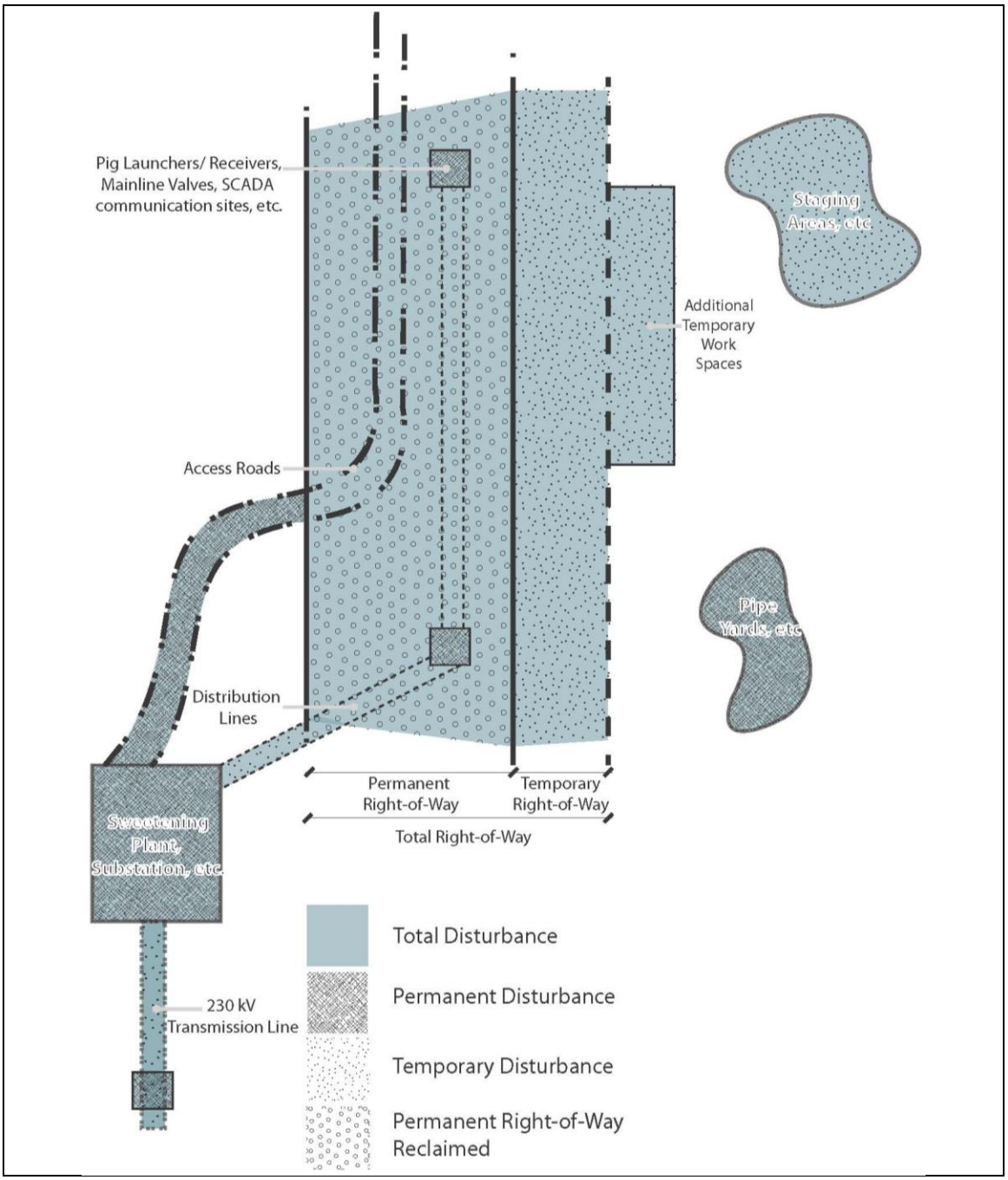


Figure 2-3 Estimated Temporary and Permanent Disturbance

A significant portion of the proposed pipelines would parallel existing right-of-ways or other linear disturbance. As proposed, a total of approximately 127 miles (52 percent) of the pipeline routes are parallel to existing pipeline and transmission line rights-of-way, 61 miles (25 percent) parallel road rights-of-way, and 55 miles (23 percent) cross areas without linear disturbance. Table 2-5 provides additional information regarding location and distance of utilities that would be paralleled (by the Applicant's proposed pipeline routes).

Table 2-5
Summary of Existing Utilities Parallel to the Proposed Action Pipeline Route

From Milepost	To Milepost	Parallel with Pipeline/Transmission Right-of-Way	Parallel with Road Right-of-Way	New Liner Disturbance	New Linear Disturbance – Maximum Offset Distance from Existing Utility (feet)[1]	Rationale for New Linear Disturbance
0.0	10.0	✓	–	–	–	–
10.0	10.2	–	–	✓	Not applicable	Transition between rights-of-way
10.2	13.4	–	✓	–	–	–
13.4	14.1	–	–	✓	Not applicable	Transition between rights-of-way
14.1	18.2	–	✓	–	–	–
18.2	20.1	✓	–	–	–	–
20.1	23.3	–	–	✓	Not applicable	Crossing of Green River[1]
23.3	24.7	✓	–	–	–	–
24.7	29.4	–	✓	–	–	–
29.4	30.8	–	–	✓	Not applicable	Transition between rights-of-way/ Riley Ridge Sweetening Plant
30.8	34.1	–	✓	–	–	–
34.1	34.3	–	–	✓	Not applicable	Transition between rights-of-way
34.3	42.6	✓	–	–	–	–
42.6	59.7	–	–	✓	Not applicable	Transition between rights-of-way
59.7	62.5	–	✓	–	–	–
62.5	64.1	–	–-	✓	950	Sensitive area avoidance
64.1	66.0	–	✓	–	–	–
66.0	75.2	–	–	✓	Not applicable	Sensitive area avoidance; Little Sandy River crossing; Transition between rights-of-way
75.2	115.4	–	✓	–	–	–
115.4	118.2	✓	–	–	–	–
118.2	118.5	–	–	✓	475	Sensitive area avoidance
118.5	122.6	✓	–	–	–	–
122.6	123.0	–	–	✓	435	Sensitive area avoidance
123.0	147.7	✓	–	–	–	–
147.7	148.2	–	–	✓	590	Avoid paralleling stream
148.2	169.9	✓	–	–	–	–
169.9	172.0	–	–	✓	Not applicable	Avoidance of Jeffrey City
172.0	183.8	✓	–	–	–	–
183.8	184.0	–	✓	–	105	Avoid paralleling stream
184.0	192.0	✓	–	–	–	–

Table 2-5
Summary of Existing Utilities Parallel to the Proposed Action Pipeline Route

From Milepost	To Milepost	Parallel with Pipeline/Transmission Right-of-Way	Parallel with Road Right-of-Way	New Liner Disturbance	New Linear Disturbance – Maximum Offset Distance from Existing Utility (feet)[1]	Rationale for New Linear Disturbance
192.0	192.8	–	✓	–	–	–
192.8	196.0	–	–	✓	1,140	Avoidance of multiple stream crossings and steep slopes
196.0	197.2	✓	–	–	–	–
197.2	201.2	–	–	✓	Not applicable	Transition between rights-of-way
201.2	209.3	✓	–	–	–	–
209.3	212.8	–	–	✓	1,300	Avoidance of multiple road crossings; sensitive area avoidance
212.8	213.1	✓	–	–	–	–
213.1	213.6	–	–	✓	530	Sensitive area avoidance
213.6	218.3	✓	–	–	–	–
218.3	218.4	–	✓	✓	170	Stream crossing
218.4	219.0	✓	–	–	–	–
219.0	220.8	–	–	✓	430	Sensitive area avoidance; avoidance of multiple stream crossings
220.8	231.8	✓	–	–	–	–
231.8	232.4	–	–	✓	Not applicable	Transition between rights-of-way
232.4	233.6	✓	–	–	–	–
233.6	234.6	–	–	✓	1,450	Sensitive area avoidance
234.6	238.9	✓	–	–	–	–
238.9	239.3	–	–	✓	300	Sensitive area avoidance
239.3	240.0	✓	–	–	–	–
240.0	242.7	–	–	✓	Not applicable	Transition from pipeline right-of-way to Natrona Hub

NOTE: [1]At this location the Project would be constructed using horizontal direction drilling.
Not Applicable indicates areas where the centerline transitions from one existing utility corridor to another.

2.2.2.1 Additional Temporary Work Spaces

In addition to the construction right-of-way, The Applicant has identified the types of ATWSs that would be required and where these sites would be located. ATWSs include pipe storage yards and staging areas. Dimensions and acreages of typical ATWSs are identified in Table 2-6. These additional ATWSs would be needed for areas requiring special construction techniques (e.g., river, wetland, and road crossings; horizontal directional drill entry and exit points; steep slopes; and rocky soils) and construction staging areas. Prior to construction, The Applicant would be required to file a complete and updated list of ATWSs with the BLM for review and approval prior to use. Additional ATWSs on federal land would require authorization from the BLM.

Table 2-6 Dimensions and Acreages of Typical Additional Temporary Work Spaces		
Feature	**Dimensions (feet)**	**Acreage**
Road crossings	40 by 150	0.14
Stream crossing	40 by 200	0.18
Spoil storage	40 by 300	0.28
SOURCE: Denbury Request for Information Response, August 21, 2015		

2.2.3 Construction Procedures

This section describes the design, layout, and general sequence of actions required for the 3-year construction of the pipeline project. This section also includes mitigation requirements that would be implemented by the contractor. These mitigation measures are industry standards and would be used in conjunction with site-specific plans. The descriptions in this section would be the same for the Proposed Action and for the alternative routes.

2.2.3.1 Plan of Development

The Applicant submitted a preliminary POD to the BLM in March 2014 (updated in August 2014 and February 2015; refer to Appendix A of this EIS) that outlines federal-specific construction procedures, environmental requirements, Project plans, and mitigation measures that would be implemented by The Applicant during construction of the Project on federally managed land. The POD describes routine construction and reclamation procedures in upland areas as well as construction methods for crossing wetlands and waterbodies. Applicant-proposed mitigation measures also are contained in the POD.

The Applicant will prepare a final POD that includes mitigation measures that are described in this EIS. In addition, site-specific stipulations not included in the POD but determined to be necessary on federal lands would be included in any right-of-way grant or permit to drill issued by the BLM. The site-specific measures included in the POD would not contradict the mitigation measures of this EIS. The Applicant has prepared several specific plans that include measures to mitigate for potential impacts. These plans are intended to serve as overall best management practices (BMPs) for construction, operation, and decommissioning of the entire Project, on both federally managed and non-federally managed lands (refer to Appendix A). The plans in the POD include:

- Appendix G Applicant-Committed Measures and Best Management Practices
- Appendix H Stormwater Pollution Prevention Plan
- Appendix I Hydrostatic Test Plan
- Appendix J Frac-Out Contingency Plan
- Appendix K Hazardous Materials Management and Spill Prevention, Control, and Countermeasures Plan
- Appendix L Noxious Weed Management Plan
- Appendix M Emergency Response Plan

The appendices of the POD will be finalized for the final version of the POD.

2.2.3.2 Preconstruction Survey and Staking

Once a route is selected for construction, permit stipulations to address all predicted biological, paleontological, and cultural resources effects (including preconstruction survey requirements) would be determined based on the results of the analysis in this EIS. Contractors should know of any designated avoidance areas and seasonal restrictions. These designated areas would be included on the construction alignment sheets.

Following submittal of the report detailing the Class III cultural resources inventory, the Applicant would prepare a monitoring and treatment plan that, in part, details procedures to be followed by environmental inspectors (EI), construction personnel, and additional cultural resource monitors in the event of cultural resource discoveries during construction. This plan would be submitted to the BLM as the lead federal agency for SHPO and consulting party review and concurrence. Similarly, a Paleontological Resources Treatment Plan would be prepared based on the results of preconstruction surveys to outline additional surveys that may be needed for the preferred route and a monitoring plan for construction. These procedures would be reviewed during training of construction contractors.

Civil engineering surveys would identify the centerline of the pipeline and the boundaries of both sides of the approved working limits before construction activities commence. The Applicant's construction inspectors would be responsible for verifying that the limits of authorized construction work areas are staked prior to construction. Flagged or painted lath would be set at 200-foot intervals (maximum), or as required to maintain line of sight, along the proposed centerline. All ATWS would be identified in a similar fashion and all four corners of each temporary-use area would be flagged or marked with painted lath. This staking would clearly demark the boundary of the area that can be used or accessed by construction personnel. Spoil piles or equipment would not be placed (or driven) beyond these stakes.

Prior to earth-moving activities, BMPs would be implemented to limit sediment transport and erosion. General areas requiring BMPs would be designated on the construction alignment sheets. BMPs are usually site-specific and depend on current site and weather conditions. The EIs also would be responsible for designating areas that need BMPs or adjust BMPs, as needed. A Stormwater Pollution Prevention Plan (SWPPP) prepared for the Project, and included in the POD, contains specific BMP information and installation. The SWPPP would be referred to throughout the Project to ensure proper sediment and erosion control and reporting procedures.

2.2.3.2.1 Survey Monuments

All survey monuments found within the right-of-way would be protected. Survey monuments include General Land Office (GLO) and BLM Cadastral Survey Corners, reference corners, witness points, U.S. Coastal and Geodetic benchmarks and triangulation stations, military control monuments, and recognizable civil (both public and private) survey monuments. If any survey monuments found within the right-of-way or temporary-use areas are disturbed or obliterated during the course of the Project, the contractor would immediately report it to the Applicant. The Applicant would report the incident in writing to the Authorized Officer and the respective installing authority, if known. The Applicant would be responsible for costs associated with replacing any disturbed or obliterated survey monuments.

2.2.3.3 Construction Equipment and Construction Sequence

Standard pipeline construction techniques would be employed along the pipeline route and typically involve the following sequential operations: clearing and grading, ditching, stringing and bending, welding, joint coating, lowering and backfilling, hydrostatic testing, and cleanup and restoration. The construction techniques described herein would be used unless site-specific conditions warrant special methods. Construction of the Project would begin after all private rights-of-way, state and federal rights-of-way, and permits have been acquired for the Project.

Company personnel, construction contractors, and EIs would discuss and implement the prepared procedures prior to construction. Typical construction equipment for this type of project includes pickup trucks, loaders, various sized dozers, shovels and backhoes, side booms, generators, and bending machines. Most of the equipment to be used during right-of-way reclamation would consist of dozers, blades, and trackhoes. Typical schematics for construction, including wetland and stream crossings, are

included in Appendix C of the POD (refer to Appendix A of this EIS). Figure 2-4 demonstrates the typical pipeline construction sequence.

Construction activities would occur during daylight hours. No permanent nighttime lighting would be constructed on any of the Project infrastructure components. Limited lighting features would be placed at the utility tie-in locations on BLM-administered land. These lights would not be used regularly, but would be available for limited nighttime use during emergency maintenance activity.

If construction occurred during a storm event, vehicle traffic and equipment would be restricted to prevent rutting in excess of approximately 4 inches deep.

2.2.3.3.1 Clearing, Grading, and Topsoils

There would be several right-of-way configurations depending on proximity to other lines and available working space. As described by the Applicant, the nominal construction right-of-way width would be a 50-foot permanent width and an additional 25- to 50-foot temporary construction right-of-way width, except in the sensitive areas where the temporary width is less than 50 feet (depending on the pipe diameter and sensitive environment). Refer to Sections 2.2.1 and 2.2.3 for information related to ATWS.

Most of the right-of-way crosses typical Wyoming Basin topography and vegetation primarily composed of sagebrush steppe, but should any trees be encountered, tree limbs and brush would be windrowed or piled for use during reclamation when possible. Stumps would be left in place except over the trench line or removed as needed to create a safe and level workspace. The EI would coordinate with the BLM or appropriate agency or landowner to locate areas for stump disposal when necessary. Trees would be felled inside the approved right-of-way boundaries. Grading would not occur over historic trails, perennial streams, or wetlands.

Construction activity and ground disturbance would be limited to approved, staked areas. Whenever possible, grading would be limited to help preserve vegetation and reduce impacts, which would limit erosion and improve reclamation success. In mountain or hilly terrain where slopes run across the right-of-way, a level work area must be cut out of the hillside for safe construction. These areas would be reclaimed to the natural contours as much as possible.

Where grading is needed to create a safe, level, working area, topsoil would be stripped from the full construction right-of-way prior to cut, fill, or grading operations. There may be some areas where the contractor would not need to grade the topsoil. For example, level fields or pastures may not need to be graded for construction. In these cases, the contractor can avoid topsoiling, except over the trench line, which would preserve the root system and increase reclamation success. Available topsoil would vary across the Project. No matter the amount of topsoil removed, topsoil would be stockpiled separately from subsoil and would not be used to pad the trench or construct trench breakers. Topsoil would be used (spread) as the top layer of soil during the reclamation process.

In wetlands, only the topsoil on the trench line would be removed (dug) and segregated before digging and removing the subsoil (double-ditching method). Topsoil removal in wetlands can range between 12 to 18 inches, but the EI would determine available topsoil per site conditions. In floodplains, the topsoil depth can range from 6 to 12 inches. Dry ephemeral drainages (arroyos and swales) that cross the right-of-way would not be blocked with topsoil piles. Topsoil would be placed on the banks of the drainage so natural flows are not impeded and topsoil is not washed away. For additional details on crossing streams and wetlands, refer to Chapter 4.

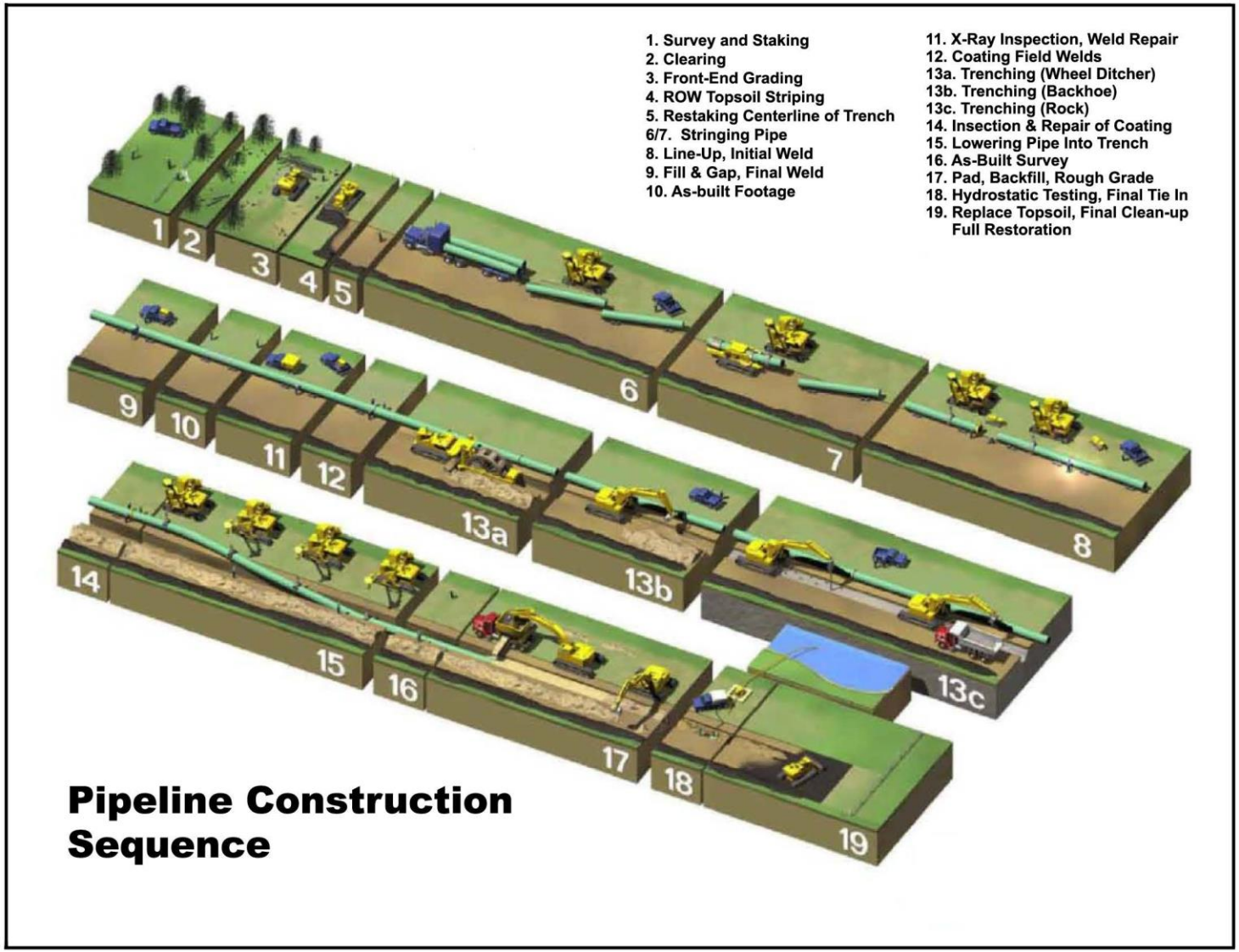


Figure 2-4 Pipeline Construction Sequence

2.2.3.3.2 Trenching

Construction methods used to excavate a trench would vary depending on soils, rock, terrain, and related factors. Excavated subsoil would be stored separately from windrowed topsoil piles. Like topsoil, subsoil would not be stored in flowing waterbodies, dry drainages, or washes that cross the right-of-way. Gaps would be left periodically in the subsoil piles to avoid ponding and excess diversion of natural runoff during storm events, where necessary.

Measures would be taken to ensure that access is provided for private landowners or tenants to move vehicles, equipment, and livestock across the ditch, where necessary. Adequate precautions also would be taken to ensure that livestock is not prevented from reaching water sources because of the open ditch. The maximum and typical duration that the excavated trench would remain open prior to installing the pipeline and backfilling would be 14 days.

Soft plugs in the trench would be spaced at intervals of no more than 0.25 mile, or as frequently as determined by the EI, to allow for the passage of vehicles, livestock, and wildlife. When pipe is strung on the right-of-way and during welding operations, breaks would be left in the pipeline to allow for the passage of livestock and wildlife at approximately the same intervals as the soft plugs. Open trenches would be inspected daily for trapped livestock or wildlife. Soft plugs would be of minimal compaction and installed with ramps.

The depth and width of the ditch would vary depending upon pipe diameter and soil types. A typical ditch would be excavated approximately 3 to 4 feet wide at the bottom and the sides would be sloped to OSHA specifications (up to approximately 8 feet wide).

The minimum cover would vary depending on soil type and existing conditions. Table 2-7 stipulates the different cover requirements. These stipulations may change depending on the existence of other utilities.

Table 2-7
Minimum Depth of Cover Requirements

Crossing Type	No Rock (minimum inches)	Rock Trench (minimum inches)
Standard trench	36	30
Agricultural land[1]	60	60
Water crossings	60	60
Drainage or ephemeral waterways	60	60
Road crossings	60	60
Drainage ditch at public road crossing	48	48
Wetlands	60	60

NOTE: [1]Double ditching required for agricultural areas

Occasionally, the ditch could be excavated to depths greater than the minimum values specified to achieve specific cover. Greater depths of cover could be required at unpaved road crossings, foreign pipeline crossings, waterbodies, and other obstructions. Machine excavation would not be performed closer than 5 feet from any existing pipeline encountered in the right-of-way unless authorized by the pipeline owners/operators. Existing pipeline locations would be marked in the field and 48-hour prior notification given to the operator of the underground utility. Where the pipeline crosses locations for which there are definite plans to level the land for irrigation or other purposes, the pipe would be buried at a depth to accommodate these plans.

If the trench fills with water and interferes with installation, the trench would be dewatered. If dewatering is required, then discharge of the water would be performed in accordance with Wyoming Department of

Environmental Quality (WDEQ) regulations and permit requirements. Any trench dewatering would be coordinated with the EI to ensure permit compliance.

2.2.3.3.3 Blasting

Where rock is encountered, tractor-mounted mechanical rippers or rock trenching equipment may be used to facilitate excavation. In areas where rippers or trenchers are not practical or sufficient, blasting may be employed. Blasting would be used only where necessary and conducted by a fully licensed operator. All necessary authorizations would be obtained and all safety precautions observed. All blasting work would be conducted in compliance with federal, state, and local laws, rules, and regulations. The contractor is responsible for obtaining permits to store blasting materials. Blasting would not occur without BLM approval regarding sensitive cultural and/or paleontological areas.

2.2.3.3.4 Road and Railroad Crossings

Installation of road crossings shall be achieved by boring or open cut techniques, depending upon local regulations, traffic, construction equipment availability, and cost. Crossings at two-track roads and gravel roads would typically be open cut. All paved county roads and state highways would be crossed via slick bore or small directional drill bore method. A means for mechanical protection for barrow ditches of county roads would be provided. Set-on concrete pipe weights would be used to cover the pipeline in these ditches. Road crossings would not be cased.

All road and railroad crossings would be designed in accordance with ASME B31.4 and API RP 1102.

Table 2-8 shows the anticipated major road and railroad crossings and crossing techniques for this portion of the Project. No railroads would be crossed by the Project.

Table 2-8
Major Road and Railroad Crossings

Name	Location (Milepost)	Type of Surface	Length of Crossing	Crossing Method
Calpet Road (County Road 134)	10.9	Paved	45 feet	Bore
U.S. 189	20.5	Paved	150 feet	Bore
U.S. 191	55.1	Paved	300 feet	Bore
WY 28	73.3	Paved	200 feet	Bore
U.S. 287	171.5	Paved	175 feet	Bore
WY 136	197.4	Paved	100 feet	Bore
No Active Railroad Crossings	Not applicable	Not applicable	Not applicable	Not applicable

2.2.3.4 Pipe Installation

Pipe installation would include stringing, bending for horizontal or vertical angles in the alignment, welding the pipe segments together, inspecting, coating the joint areas to prevent corrosion, and then lowering-in and padding as described in greater detail below.

2.2.3.4.1 Stringing

Line pipe would be shipped directly by rail from the manufacturer to off-loading areas and then hauled to staging areas where stringing trucks collect and deliver the pipeline to the right-of-way. Each individual joint of pipe would be unloaded with a side-boom or trackhoe and placed (strung) parallel to the ditch in a continuous line. Sufficient pipe for road or waterbody crossings would be stockpiled at temporary-use areas near the crossings.

Stringing operations would be coordinated with trenching and installation activities to properly manage the construction time at a particular tract of land. Gaps would be left at access points across the ditch to allow crossing of the right-of-way.

2.2.3.4.2 Bending

After joints of pipe are strung along the ditch, but before the joints are welded or pressed together, individual joints of pipe would be bent to accommodate horizontal and vertical changes in direction. Field bends would be made utilizing a hydraulically operated bending machine. Where the deflection of a bend exceeds the allowable limits for a field-bent pipe, factory (induction) bends would be installed.

2.2.3.4.3 Welding

After pipe joints are bent, the pipe joints would be lined up end-to-end and clamped into position. The pipeline joints would be welded together in conformance with 49 CFR Part 195 Subpart D (Construction).

2.2.3.4.4 Welding Inspection

Welds would be visually inspected by an American Welding Society-certified inspector who is part of the construction management staff. Nondestructive radiographic inspection methods would be conducted in accordance with USDOT requirements. Percentage of welds radiographically inspected would be according to 49 CFR Chapter 1 (192.243 Nondestructive testing). A specialized contractor, American Welding Society-certified to perform radiographic inspection, would be employed to perform this work. Any defects would be repaired or cut out as required under the specified regulations and standards. Documents that verify the integrity of the pipeline would be kept on file by The Applicant for inspection by the OPS, USDOT.

2.2.3.4.5 Coating

To prevent corrosion, the pipe would be externally coated with fusion bonded epoxy coating prior to delivery. After welding, field joints would be coated with a tape wrap, shrinkable sleeve wrap, or field-applied fusion bond epoxy. This step is not necessary for pressure fitted pipe. Before the pipe is lowered into the ditch, the pipeline coating would be visually inspected and tested with an electronic detector, and any faults or scratches would be repaired.

2.2.3.4.6 Cathodic Protection

Cathodic protection test sites would be installed at accessible locations, at intervals of 2 miles or less, to measure the pipe-to-soil potential for the establishment and maintenance of an effective cathodic protection system. Refer to Figure 2-5. Three to four cathodic beds may be needed and would likely be located at MLV and/or L/R locations. Test leads would be spaced every 2 to 3 miles depending on terrain and accessibility. A test lead is an electric wire that is welded to the pipe and is housed in a 2-inch PVC pipe riser. No electric power is needed for the test leads. The test lead would be used to verify adequate cathodic protection on the pipe is provided.

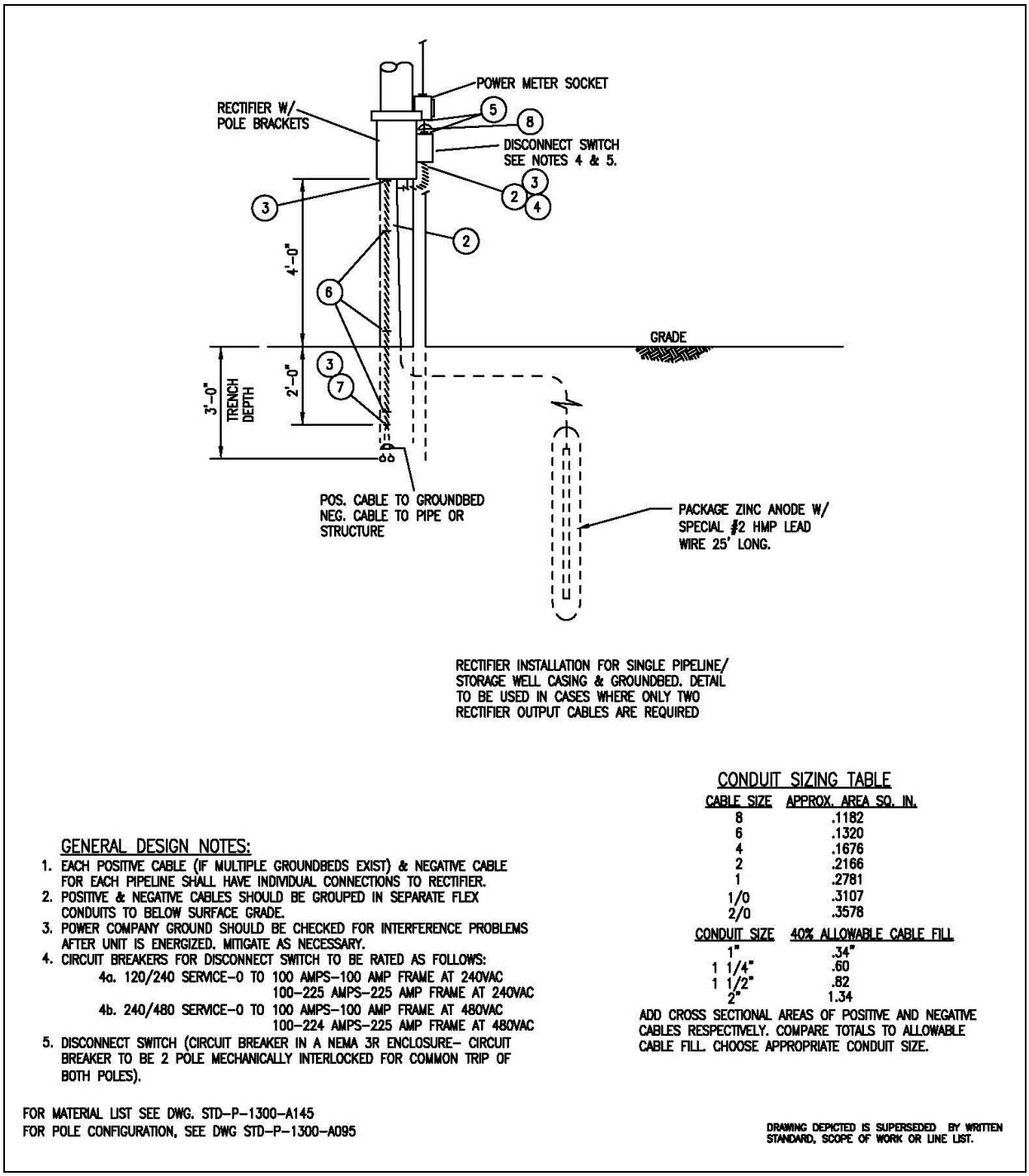


Figure 2-5 Typical Cathodic Protection Unit

2.2.3.4.7 Lowering-In and Padding

Before the pipe section is lowered into the ditch, inspection would be conducted to verify that the pipe is properly fitted and installed into the ditch, minimum cover is provided, and the trench bottom is free of rocks and other debris that could damage the external pipe coating. Side-boom tractors would be used to simultaneously lift the pipe section, position it over the ditch, and lower it into place. Specialized padding machines may be used to sift soil fines from the excavated subsoils to provide rock-free pipeline padding and bedding. Sandbags may be used to pad the bottom of the ditch instead of, or in combination with, padding with soil fines. In rocky areas, padding material or a rock shield would be used to protect the pipe. No topsoil would be used to pad the pipe.

2.2.3.4.8 Backfilling

Backfilling would begin after a section of pipe has been successfully placed in the ditch. Trench breakers would then be installed, as needed. Prior to backfilling the trench, the equipment operator would check the trench for wildlife and/or livestock and would be sure any wildlife or livestock found in the trench is removed before backfilling begins. Backfill would be conducted using a bulldozer, rotary auger backfiller, padding machine or other suitable equipment. Backfilling the trench would generally use the subsoil previously excavated from the trench, except in rocky areas where imported select fill material may be needed.

Backfill would be graded and compacted, where necessary for ground stability, by tamping or walking with a wheeled or tracked vehicle. Compaction would be performed to the extent that there are no voids in the trench. Backfill of trenches would not be performed where the soil is frozen to the extent that large consolidated masses are formed that would not break down. In irrigated agricultural areas, the backfill would be replaced at the same compaction density as the adjacent undisturbed soil. Backfill of trenches at road crossings would be in accordance with the crossing permit. Any excavated materials or materials unfit for backfill would either be utilized elsewhere or properly disposed of in conformance with applicable laws or regulations.

2.2.3.5 Hydrostatic Pressure Testing and Water Use

Each pipeline would be tested in compliance with USDOT (49 CFR Part 195) and WDEQ regulations. The test water would be obtained from a permitted source through a water use agreement with the state engineer and/or as negotiated with water rights owners or commercial wells.

Water rights granted by the State of Wyoming allow use of surface water and groundwater for specific purposes. Types of well use classifications include industrial, domestic, stock, irrigation, monitoring, and coal bed CH_4. Groundwater would be obtained from a well-use classification consistent with the construction activities. If a surface water or groundwater source with the proper use classification is not available, a petition can be filed with the Wyoming State Engineer's Office (SEO) to add or change the use or an application for temporary uses of the water can be requested. After selecting a preferred route, a water source(s) capable of providing a sufficient volume of water of acceptable water quality would be identified by the owner and proper permission(s) for water use would be obtained through the State of Wyoming Water Rights permitting process prior to beginning construction. Water sources would be required to meet applicable water quality standards prior to use in case discharge of the water under a WDEQ permit is required. For example, Condition 4.d.(5) of the WDEQ's *Statewide permit of land application of hydrostatic test water (Permit No. 97-201)* requires that water from sources other than stock or domestic wells, municipal sources, or live streams be tested for the parameters listed in WDEQ Rules and Regulations Chapter 8, Table I (Groundwater Standards). If water sources do not meet these groundwater standards, then The Applicant could be required to apply for and receive a site-specific land application permit (refer to Condition 5.a. of *Statewide permit of land application of hydrostatic test water).* These water sources could also require additional review under the ESA and SEO processes. Prior

to filling the pipeline with water for a hydrostatic test, each section of the pipeline would be cleaned to remove any foreign material or residue that entered during construction by passing reinforced poly pigs through the interior of the pipeline. The entire pipeline would be hydrostatically tested to at least 125 percent of maximum operating pressure. Hydrostatic testing water that is not re-used for other purposes would be discharged in accordance with the WDEQ permit conditions. A detailed description of hydrostatic pressure testing procedures is included in Appendix I of the Applicant's preliminary POD (included as Appendix A of this EIS). Anticipated hydrostatic test water sources are included in Table 2-9.

Table 2-9
Hydrostatic Test Water Sources

Anticipated Source	Nearest Milepost	Approximate Volume	Approximate Volume (acre-feet)	Watershed
Green River	21.6	2,000,000	6.1	Upper Green
Big Sandy	55.3	7,000,000	21.4	Big Sandy
Yates Petroleum Well	114.0	5,000,000	15.3	Great Divide Closed Basin
Impoundment Drainage	160.2	3,000,000	9.2	Sweetwater
Sweetwater River	173.7	8,000,000	24.6	Sweetwater
Middle Casper Creek	238.6	3,500,000	10.7	Middle North Platte
NOTE: Sources identified for the Proposed Action				

Consumptive water use would be required for directional drilling and dust abatement. Water would be obtained from a permitted source for mixing with bentonite during directional drilling at the horizontal directional drill crossings. Additional water would be obtained from permitted sources (irrigation companies or municipal sources) for dust abatement. The dust abatement contractor would be responsible for obtaining any necessary permits.

2.2.3.6 Fugitive Dust Control

Construction activities and the use of unpaved roads would result in varying degrees of fugitive dust emissions. BMPs that may be used to control fugitive dust during construction, when necessary or during periods of dry conditions, include the following:

- Water and/or a non-toxic chemical dust suppressant, alone or in combination with mulches, would be applied to areas of disturbance to minimize fugitive dust emissions.
- Use of wind fences, berms, or covering material, such as gravel or textiles, in areas of disturbance would be used to minimize fugitive dust emissions.
- Unpaved roads in the construction area that pass within 0.25 mile of inhabited dwellings would either be watered or treated with a non-toxic chemical suppressant.
- Minimization of vegetation clearing and intense reclamation of cleared areas.

Water for fugitive dust control purposes would be obtained as needed, prior to construction, through permits or purchase contracts with owners of valid existing water rights. Federal, state, and local air quality standards would be met during construction. The water source would be evaluated using the same procedures described in Section 2.2.3.5. Site revegetation would be conducted in accordance with The Applicant's reclamation procedures, which would also reduce dust emissions.

In general, water would be used as needed during the construction of the pipeline, Riley Ridge Sweetening Plant, and transmission/distribution lines; drilling of injection wells; and use on the access roads. Approximately 4.6 acre-feet (1,500,000 gallons) of water is needed for fugitive dust control for every 10 miles of pipeline construction or access road use. Approximately 15.3 acre-feet (5,000,000

gallons) of water is needed during the construction of the Sweetening Plant. It is anticipated that approximately 164 acre-feet of water would be needed for fugitive dust control. The anticipated water uptake requirements and water sources for fugitive dust control are detailed in Table 2-10.

Table 2-10
Anticipated Water Uptake Requirements and Water Sources for Fugitive Dust Control

Anticipated Source	Nearest Milepost	Approximate Volume (gallons)	Approximate Volume (acre-feet)	Watershed (Hydrologic Unit Code 8)
Green River	21.6	4,724,666	14.5	Upper Green
Green River	24.5	5,000,000	15.3	Upper Green
Big Sandy River	55.3	5,685,000	17.5	Big Sandy
Little Sandy Creek	69.1	1,410,000	4.3	Big Sandy
Middle Ranch #1 Well	78.5	2,760,000	8.5	Big Sandy
Brannon Reservoir #2	121.4	3,675,000	11.3	Great Divide Closed Basin
Hay Reservoir	124.2	360,000	1.1	Great Divide Closed Basin
Picket Lake	126.7	435,000	1.3	Sweetwater
Scotty Lake (Brannon #1 Reservoir)	127.6	135,000	0.4	Sweetwater
McKay Lake	128.4	2,685,000	8.2	Sweetwater
Impoundment in drainage	160.2	4,380,000	13.4	Sweetwater
Mill Well #3	173.3	3,300,000	10.1	Sweetwater
Quarry	195.7	615,000	1.9	Muskrat
Reid Reservoir	199.8	615,000	1.9	Muskrat
Medicine Springs Reservoir	204.0	2,611,500	8.0	Lower Wind
Middle Casper Creek	238.6	3,240,000	9.9	Middle North Platte

2.2.3.7 Reclamation

Reclamation is the process of returning the land to predisturbance condition as specified by the land-management agencies and the appropriate landowner. Project areas that would require reclamation for following construction include Project right-of-way, ATWS locations, access roads, and other Project facilities.

2.2.3.7.1 Cleanup

All construction debris and miscellaneous items would be removed from the construction site and disposed of properly by the contractor. No trash would be buried. The Applicant would provide trash cages along the Project for trash to be disposed of daily. All fences and roads would be replaced or rebuilt as negotiated with the landowner.

The Applicant would commence cleanup operations immediately following backfill operations. Final grading, topsoil replacement, and installation of permanent erosion control structures would take place within 20 days after completion of construction activities. If seasonal or other weather conditions prevent compliance with these time frames, temporary erosion controls (temporary slope breakers and sediment barriers) would be maintained until conditions allow completion of cleanup. Additional cleanup would include the following:

- Rock excavated from pipeline trenches may be used to backfill trenches. Rock that is not returned to the trenches is considered to be construction debris, unless approved for use as mulch or for some other use on the construction work areas by the landowner or the BLM.

- Excess rock would be removed from the soil at the landowner's or BLM's request. The size, density, and distribution of rock on the construction work area should be similar to adjacent areas not disturbed by construction. The landowner or the BLM may approve other provisions in writing.
- The construction right-of-way would be graded to restore preconstruction contours and soil would be left in the proper condition for planting.
- Construction debris would be removed from all construction work areas unless the landowner or the BLM approves otherwise.
- Temporary sediment barriers would be removed when replaced by permanent erosion control measures or when revegetation is successful.

In addition, the Applicant will arrange for sanitary waste disposal through agreements with local municipal sanitary waste treatment facilities.

2.2.3.7.2 Interim Reclamation

During Project construction, reclamation would be conducted to stabilize disturbed areas and to protect adjacent areas from degradation. Soil erosion controls would be put in place to reduce the amount of soil carried offsite and to minimize disturbance to topsoil. All topsoil would be side cast for replacement later in the reclamation process. Salvaged topsoil would be applied as soon as possible to the reclaimed area.

Following construction, right-of-way corridors would be backfilled and revegetated. Specific seed mixes would be chosen by the agencies/landowners. Access roads would be revegetated to the degree stipulated by the agencies/landowners and, in some cases, may be reduced in width or reseeded completely to return the road to a natural condition. These areas may require recontouring. All of the right-of-way, ATWSs, and other temporary workspaces would be revegetated. All permanent above-ground facilities (including valve sites, yards, meter stations, and L/R facilities) would be maintained with fencing and gravel.

2.2.3.7.3 Final Reclamation

Ground disturbances would be reclaimed according to the surface use agreements, BLM requirements, and WDEQ stormwater construction permits and SWPPPs. Reclamation would occur in areas where ground-disturbing activities have been completed or concurrent with other operations in the Project area. Typically, disturbed areas not needed for production operations or during final reclamation would include removal of facilities, abandonment of pipe and power lines, recontouring to resemble the surrounding terrain, installing necessary erosion control measures, and seeding disturbed areas with certified weed-free mix agreed upon by the BLM and completed within 6 months or as soon as environmental conditions are appropriate after a specific activity has been completed. Seeding would occur in accordance with the local agency, conservation district, and/or BLM protocols. Seeding would typically take place in the fall of each year, after October 1. If seeding occurs in the spring, it would typically be completed by May 15.

Reclamation activities would be conducted in accordance with the surface owner agreements, the BLM requirements, WDEQ stormwater construction permits, and SWPPPs.

2.2.3.7.4 Monitoring and Maintenance

The overall goal of the Applicant's reclamation monitoring program is to assess and ensure reclamation activities would be conducted in accordance with BLM methodology and other regulatory requirements. Monitoring would continue until at least 70 percent or greater of vegetation, as compared to the surrounding undisturbed areas, have been re-established. If, either before or after two growing seasons, vegetation has not progressed or there is concern due to climatic forecasts that vegetation may not become established, further site evaluation may be required.

Once construction and installation are complete, the Applicant would monitor for and treat noxious weed infestations in the Project area. Noxious weed monitoring would be conducted concurrently with the site-specific reclamation plan monitoring. Implementation of the interim and final reclamation would minimize construction-related impacts on vegetation.

2.2.3.7.5 Seeding Requirements

The Applicant would apply seed to all disturbed areas between October and May of each year. Seed would be certified weed-free. The Applicant would apply mulch as needed, and the mulch would be crimped whenever conditions/slopes allow. The Applicant remains responsible for achieving acceptable reclamation after construction. Additional reclamation efforts entail the following:

Disturbed areas would be seeded in accordance with written recommendations for seed mixes, rates, and dates obtained from the local soil conservation authority or the request of the agency/landowner. Seeding is not required in actively cultivated croplands unless requested by the agency/landowner.

Broadcast or hydroseeding may be used in lieu of drilling at double the recommended seeding rates. However, drill seeding is the preferred method for all disturbed areas. In rocky soils or where site conditions may limit the effectiveness of this equipment, other alternative routes may be appropriate (e.g., use of a chain drag) to lightly cover seed after application, as approved by the EI.

Mulch would be certified weed-free straw and would be applied directly after seeding, as discussed and approved by the agency/landowner. In accessible areas, weed-free straw would be applied with a straw sprayer and then crimped with a tractor pulled implement.

Seed availability, especially for forbs, and new information learned about reclamation species may require adjustments at the time of actual seeding. Additionally, reclamation success would be monitored, with adjustments made to the seed mix if necessary to improve re-establishment success. Modified seed mixes may be applied in ecologically unique or atypical soil settings. Any proposed changes to the seed mix would require approval by the BLM prior to implementation.

2.2.3.8 Livestock Barrier and Other Livestock Issues

Fences crossing the right-of-way would be braced, cut, and temporarily fitted with gates to permit construction traffic passage. During construction, the opening would be controlled as needed to prevent the escape of livestock. Gates are typically installed with chained locks to allow access to the right-of-way after construction, as negotiated with landowners. During construction, the contractor would take care not to obstruct or damage gates or cattle guards. Those damaged or made inoperable would be repaired to landowner satisfaction. The contractor would repair all damaged livestock facilities (corrals, fences, water sources, etc.) as negotiated with the landowner and/or grazing permittee.

2.2.3.9 Horizontal Directional Drill

The Applicant would contract with firms that specialize in HDD. The selection and supervision of this drilling contractor would be the responsibility of The Applicant. The advantage of HDD is minimal surface impact limited to the established entry (typically 25 feet by 50 feet) and exit (typically 15 feet by 20 feet) locations for drilling equipment, which can typically be located outside the environmentally sensitive area. Due to the nature of HDD, the potential for frac-out exists. Frac-out occurs when drilling fluid is released during installation, which can occur when pressure in the drill hole is not maintained and a loss of circulation of drilling fluids occurs. Procedures for controlling this situation are described in the Frac-out Contingency Plan (Appendix J of the POD [Appendix A]).

The entry and exit boxes vary in size depending on the diameter of the drill and associated equipment required. No ground disturbance would occur between the entry and exit drill path locations.
Table 2-11 summarizes all of the horizontal directional drills that are currently proposed for the Project. These horizontal directional drills have been incorporated into the Project design to minimize impacts on wetlands/waterbodies and historic trails (per agency input).

Table 2-11
Proposed Horizontal Directional Drilling Locations

Feature Name	Approximate Milepost	Horizontal Directional Drilling Footage
Spring Creek	3.2	500
Green River	21.5	2,000
Big Sandy River	55.2	2,000[1]
Historic Trail	67.7	3,000
Historic Trail	70.7	3,500
Historic Trail	75.1	2,500
Sweetwater River	173.7	2,000[1]

NOTE: [1]May be open cut depending on water flows at the time of construction.

2.2.3.10 Waterbody Crossings

Where necessary, a nationwide permit would be obtained from the USACE prior to construction when crossing Jurisdictional Waters. Waterbody crossing totals by county are shown in Table 2-12. Four crossing methods are discussed below and the typical drawings per crossing method are included in Appendix C of the POD (Appendix A). Due to the large number of drainage channels that are anticipated to be encountered during construction, the type of water crossing method would be identified for the selected route and included in the final POD.

Table 2-12
Waterbody Crossing Totals by County – Wyoming

County	Ephemeral	Intermittent	Seasonal	Perennial	Grand Total
Sublette	29	2	1	4	36
Sweetwater	18	6	0	2	26
Fremont	23	18	0	4	45
Natrona	38	10	0	5	53
Subtotal	108	36	1	15	160

Perennial and intermittent stream boundaries would be flagged or signs would be installed prior to construction to indicate change in right-of-way clearing and grading requirements. Stormwater BMPs would be used to protect water resources and minimize sedimentation in waterbodies. ATWSs have been designated in these areas to provide extra work space but would be located at a minimum of 50 feet away from wetland and waterbody boundaries.

Construction equipment working in wetlands and waterbodies would be limited to equipment that is essential for trench excavation, pipe fabrication and installation, and backfilling. In areas where there is no reasonable access to the right-of-way except through wetlands/waterbodies, nonessential equipment would be allowed to travel through wetlands/waterbodies only if the ground is firm enough or construction matting has been installed for a driving lane. An EI would be present during the construction phase to ensure boundaries are identified and all BMPs are implemented correctly. The EI and contractors would coordinate closely during these procedures to ensure permit compliance.

Equipment bridges would be installed per the typical drawings included in Appendix C of the Applicant's preliminary POD (included as Appendix A of this EIS). Equipment bridges would be constructed to

maintain unrestricted flow in the waterbody, and they would be able to withstand and pass the highest flow that might occur while the bridge is in place. Bridges would be maintained to prevent soil from entering the waterbody, and they would be removed as soon as possible after all construction activities are completed.

Wetland/waterbody crossings would be reclaimed as soon as possible to protect water quality. Any material that has accumulated in a waterbody would be removed, and all drainages would be returned to as close to preconstruction condition as possible. Stream banks that contain upland vegetation would be reseeded. Stream banks and slopes leading directly to streams and wetlands would be reseeded, and natural ground matting would be installed as needed to limit erosion and promote seed germination.

2.2.3.10.1 Horizontal Directional Drill

The typical minimum depth of the HDD would be 25 feet or 6 feet below the stream bed whichever provides the highest margin of safety. Due to the nature of HDD, the potential for frac-outs exists. Frac-out occurs when drilling fluid is released during installation, which can occur when pressure in the drill hole is not maintained and a loss of circulation of drilling fluids occurs. Procedures for controlling this situation are described in the Frac-out Contingency Plan (Appendix J of the POD [Appendix A]).

This method of crossing would eliminate any future ground disturbance associated with an operating company's required annual maintenance for bank stabilization and depth of cover control typically required for an open ditch crossing. In some cases, equipment may still need to cross these areas to continue construction flow. In these cases, temporary bridges would be constructed and wetlands would be matted. Table 2-13 lists all of the proposed HDD crossings. This method may be used at other locations if deemed necessary by the BLM to avoid or minimize environmental effects.

Table 2-13
Horizontal Directional Drilling Crossings: Waterbodies, Wetlands, Railroads, and Roads

Waterbody Name	Milepost	Horizontal Directional Drilling Footage (approximate feet)
Spring Creek	3.2	500
Green River	21.6	2,000
Big Sandy River	55.3	2,000[1]
Sweetwater River	174.0	2,000[1]

NOTE: [1]May be open cut depending on water flows at the time of construction.

2.2.3.10.2 Flume and Trench

The flume and trench method would be used in most situations where there is flowing water. Depending on the size of the drainage, the contractor would determine the proper size and number of flume pipes needed to handle expected volumes of water. The flumes would be placed in the drainage and sand bags would be placed around the inlet to direct flow into the pipes. The flumes also could utilize wing-walls to direct water to the inlet. Sandbags also should be placed around the outlet of the flumes to reduce backflow into the working area. During the placement of the flumes, the channel and banks should be disturbed as little as possible.

The pipeline trench would be dug beneath the flumes. Spoils from the trench would be placed in an upland area that is protected through implementation of BMPs to prevent discharge back into the channel. The ATWSs would be located at least 50 feet from the water. When backfilling the trench, no foreign material should be added to the stream channel and the channel should be recontoured as close as possible to original condition. An EI would be present during all water and wetland crossings and would coordinate closely with the contractor to ensure permit compliance. These areas would be reclaimed as soon as possible to protect water quality.

2.2.3.10.3 Open Cut

The open cut method would be used when crossing dry arroyos, swales, and minor drainages that are not carrying water. Spoils from the trench would be placed in an upland area. Open cut trenches would be inspected by a professional archaeologist. Monitoring and trench inspection areas would be defined in a monitoring and treatment plan submitted to the BLM, as the lead federal agency, for SHPO and consulting party review and concurrence. All open cut trenches located in formations with a moderate to very high potential fossil yield classification (PFYC [3 to 5]) would be monitored by a professional paleontologist. The channel would not be blocked in case a storm event results in flowing water. When backfilling the trench, no foreign material would be added to the channel and the channel would be recontoured as close as possible to original condition. These areas would be reclaimed as soon as possible to protect water quality.

2.2.3.10.4 Wetlands

Wetlands would not be graded; only the topsoil on the trench line would be removed (dug) and segregated before digging and removing the subsoil (double-ditching method). The wetland boundaries would be flagged and/or signs installed prior to construction to indicate change in right-of-way clearing and grading techniques. The available topsoil in wetlands can vary. The EI should determine the available topsoil for removal. Erosion control devices would be installed along the construction perimeter to retain spoils onsite.

Pipeline construction operations within wetland boundaries would be reduced to a travel lane, ditch line, and spoil storage area. Mats would be installed along the travel lane in saturated wetlands to support equipment and prevent soil compaction. Shrubs and trees interfering with travel lane installation would be cut at grade level to leave root systems intact. Tracked excavators would operate off "ditching mats" to excavate the trench across the wetland. Foreign material (upland soil, rock, tree stumps, etc.) would not be imported into the wetland to stabilize the working area.

If the trench fills with water and interferes with installation, the trench would be dewatered. If dewatering is required, the discharge of the water would be performed in accordance with the WDEQ regulations and permit requirements. Any trench dewatering would be coordinated with the EI to ensure permit compliance.

Unless otherwise required by permit, wetlands would not be reseeded. Seed would come from the wetland topsoil that has been segregated for reclamation. After the pipe is installed, the trench line would be backfilled and the topsoil replaced on top. No crown would be left over the trench, and certified weed-free mulch can be applied to wetlands that are temporarily dry. Wetland crossings would be reclaimed as soon as possible to protect water quality.

2.2.3.11 Areas with Special Conditions

The pipeline would be routed to avoid impacts on special environmental and cultural resources, as much as possible. However, some areas may not be entirely avoidable. To construct through these areas, timing restrictions and construction stipulations have been established to help protect these resources.

2.2.3.11.1 Proximity to Parallel Facilities

To limit new disturbance, the Project would parallel existing utilities or roads for approximately 185 miles (76 percent) of the pipeline route. When working close to parallel existing utilities or roads, the Applicant would take added precautions during pipeline construction. Adjacent utilities would be staked the entire length and their representative would be notified prior to the initiation of construction. Construction activity would be limited over top of the adjacent utility for safety reasons.

2.2.3.11.2 Surface Slumping

The Project right-of-way would be reviewed for surface slumping in the detailed engineering design phase of the Project. If the problem is shallow surface slumping, no action is planned if outside the construction right-of-way, as it would pose no threat to the Project. If the problem is more severe than shallow surface slumping, a design would be developed to address future surface slumping. Design features of the Proposed Action related to seeding and mulching would be implemented to address potential slumping issues.

2.2.3.11.3 Bank Erosion

Waterbody crossings would be reviewed during the detailed design phase to ensure all potential bank erosion issues are addressed. Crossing approaches would be tapered to gradual slopes and water bars installed, if required, to eliminate small, abrupt changes in elevation. The new gradual slope would taper to match the undisturbed terrain. BMPs would be initiated as described in the SWPPP to reduce erosion and limit sediment transport.

2.2.3.11.4 Highly Eroded Areas

The pipeline route crosses a variety of terrain with different existing erosion potentials. In highly erodible areas, the EI would designate or modify BMPs for these areas as needed to increase stability. The BMPs may include seeding and mulching.

2.2.3.11.5 Areas of Cultural Significance

Open trench inspections would be performed for cultural resources along the entire Project by a BLM approved archaeologist. Previously identified cultural sites also would require additional construction monitoring by a BLM permitted archaeologist. Newly identified sites would be protected until they can be evaluated and any necessary mitigation applied.

A number of known cultural sites were avoided during the initial pipeline routing phase, but many were still in the area of potential effects (APE) and could be adversely affected. Cultural monitoring and trench inspection activities would be detailed in a discovery plan, monitoring plan, and NAGPRA Plan of Action, to be included with the Programmatic Agreement (Appendix B) as an appendix. Procedures for monitoring of cultural resources during construction, for the discovery of previously unknown historic properties, and for the discovery of human remains would be detailed in the Programmatic Agreement appendix. Since the appendix is a part of the Programmatic Agreement, Consulting Parties, including the SHPO and the tribes, would have the opportunity to review and comment on the procedures outlined in the appendix. Roles and responsibilities of the Authorized Officer, the Applicant, the cultural resources contractor, BLM cultural resources staff, SHPO, and tribal monitors would be described in the appendix, as well as time frames for consultation and review.

The Applicant would be responsible for the cost of any mitigation required by the Authorized Officer. The Authorized Officer would provide technical and procedural guidelines for the conduct of mitigation, as outlined in the Programmatic Agreement. Upon verification from the Authorized Officer that the required mitigation has been completed, the Applicant would be allowed to resume operations.

2.2.3.11.6 Paleontological Resources

Open trench inspections for paleontological resources would be performed by a qualified paleontologist along the portions of the right-of-way located in areas of PFYC 3, 4 and 5. Previously identified paleontological sites also would require additional construction monitoring by a qualified, BLM-permitted paleontologist. New identified sites would be protected until the site(s) can be collected or other mitigation applied. Procedures for monitoring would be outlined in the PRTP.

2.2.4 Environmental Inspection

The Applicant would be responsible for providing EIs for the Project. An Environmental Compliance Plan would be prepared that describes roles and responsibilities as well as reporting procedures for EIs for the construction and post-construction phases. This also would include post-construction inspection of stormwater management devices as stipulated in the stormwater permit from the WDEQ. Inspection personnel would have the qualifications and experience necessary to conduct environmental inspections, as well as stormwater inspections, and reporting, for pipelines. EIs would be responsible for conducting water quality sampling, per the Hydrostatic Test Plan and permits, at source and discharge locations. The Applicant also would be responsible for noxious weed control within the limits of the right-of-way and other disturbance areas. Noxious weeds would be monitored and mitigated per the Noxious Weed Management Plan.

Inspectors from the BLM, as appropriate, also would conduct field inspections during construction on federal lands. Other federal and state agencies also may conduct oversight of inspection to the extent determined necessary by the individual agency.

2.2.5 Construction Schedule

Construction of the Project would be scheduled to begin upon receipt of the BLM's ROD, notice to proceed, and right-of-way grant and all applicable federal, state, and local permits and approvals. The Applicant would hire a regional engineering and legal firm for land survey, geotechnical boring, and stormwater design and application, as well as building permits and applications. A regional firm would also be used for water well boring (if needed) and septic system design and installation. Construction would be completed over a 3-year period. The construction schedule, by spread for the pipeline, is detailed in Table 2-14.

Table 2-14
Construction Schedule by Segment

Spread Number	Construction Time Frame	Segment
Spread 1	August 1, 2018 to November 30, 2020	Riley Ridge Sweetening Plant
Spread 1	August 1, 2018 to November 30, 2018	Segment 1 (pipeline only)
Spread 2	August 1, 2019 to November 30, 2019	Segment 2
Spread 3	August 1, 2018 to November 30, 2018	Segment 3

For construction of the entire Riley Ridge Sweetening Plant, an average of 67 personnel would be involved, reaching a peak construction workforce of 174.

2.2.6 Operation and Maintenance

The Applicant would be responsible for monitoring pipeline operations after construction is completed. Monitoring activities would include environmental inspections and equipment and facility inspections. Inspection personnel would have the qualifications necessary to conduct stormwater inspections and reporting for pipelines.

An existing Denbury pipeline SCADA control center located in Plano, Texas, would be utilized with field SCADA equipment located at the supply station, MLV sites, and Riley Ridge and Bairoil meter stations, which would communicate data and status information back to the main control center. In addition, SCADA leak detection would be located at about every 4 miles along the proposed pipeline. The SCADA system is a control system that monitors the entire system for pressures, flows, receipts, deliveries, and operating conditions of the pipeline (including flowlines and injection wells). In the future, it would have the ability to change conditions on the pipeline to meet any possible changing environment and would be

able to react to emergency situations if and when they arise. It also has the capability to make call outs to the field personnel as needed or directed.

The main SCADA control center would continuously monitor pipeline pressure and flow conditions at supply and delivery points. The SCADA control system would have an alarm system that is designed to go off any time there is a deviation in pressure or flow, indicating an abnormal condition in the pipeline system. Refer to Figure 2-6 for details.

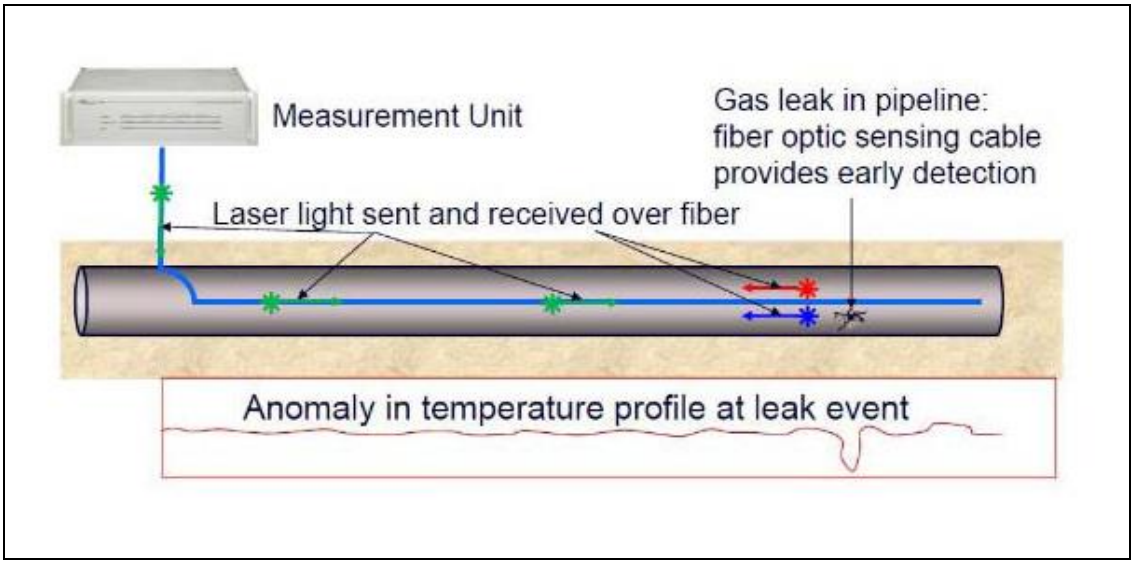


Figure 2-6 Leak Detection Typical Drawing

The Project non-gaseous H_2S/CO_2 and CO_2 pipeline systems would be operated and maintained in accordance with industry standard procedures to ensure safe operation and to maintain the integrity of its pipeline system. The Applicant's operating and maintenance procedures would be developed in accordance with the safety standards outlined in 49 CFR Part 195 and other applicable regulations. These procedures would continue to be implemented during the operation and maintenance of the pipeline facilities.

2.2.6.1 Surveillance

Communication and detection systems for the Project would be developed. The frequency of ground inspections of the pipeline would be in compliance with the OPS requirements. The right-of-way would be periodically inspected by an aerial patrol.

Stipulations to protect historic properties during operation and maintenance of the pipeline would be specified in the Section 106 Programmatic Agreement and the Historic Properties Treatment Plan (HPTP). Ground-disturbing operations and maintenance activities in or near known significant cultural or paleontological resources would not occur without prior coordination with the BLM and may require monitoring by qualified archaeologists or paleontologists.

2.2.6.2 Right-of-Way Access

Surface travel along the right-of-way would generally be limited to periodic valve inspections, leak surveys, erosion control (stormwater inspections), and any pipeline repairs that may be needed. In addition, it also would be necessary to access the right-of-way for the corrosion control inspections and noxious weed surveys. Inspections would typically be conducted with a field service truck or all-terrain vehicle.

2.2.6.3 Pipeline and Site Maintenance and Repair

Specialists and technicians would be on-call to service the pipeline. Surface traffic would be limited to workers performing pipeline and valve maintenance, periodic monitoring and inspection, and emergency repairs to the pipeline or associated equipment.

Repairs required because of minor corrosion and slight external mechanical damage to pipe and coating material can be made without interruption or with minimum interruption of service. Repairs are usually made under a reduced pipeline pressure and require a minimum amount of excavation and heavy equipment. Other minor repairs include BMP maintenance, pipeline marker replacement, and debris removal.

Some settling of the backfilled trench would occur, particularly after the first winter following construction. In this case, subsidence and potholes would be filled, if necessary, and the surface would be reseeded and restored to normal grade and if subsidence is discovered in subsequent years, the potholes would be filled.

Pipeline failures or external mechanical damage needing major repairs may require shutdown of the pipeline. In these instances, the pipeline segment could be isolated between MLVs. To facilitate these repairs, equipment, tools, pretested pipe, and other materials for emergency use could be stored at existing operations facilities.

2.2.6.4 Termination and Abandonment of Right-of-Way and Facilities

Prior to termination of the BLM right-of-way grant, or any portion thereof, the Applicant would contact the BLM Authorized Officer to arrange for a pretermination meeting and joint inspection of the right-of-way. This meeting and inspection would take place a minimum of 30 days prior to termination. The meeting and inspection would be held so that an agreement on an acceptable termination and reclamation plan can be reached. This plan would include information on abandonment and/or removal of facilities, drainage structures and/or surface material, recontouring, replacing of topsoil, seeding, and monitoring (including monitoring of noxious weeds). The Authorized Officer must approve the plan in writing. The Applicant would relinquish all, or those specified portions, of the right-of-way in accordance with the termination plan.

2.2.7 Connected Actions

A new transmission line would be needed to supply energy to the Riley Ridge Sweetening Plant. On January 25, 2016, PacifiCorp (in coordination with Denbury) submitted an SF-299 to the BLM for right-of-way to construct and operate an approximately 1-mile-long 230kV transmission line that would bring power from an existing PacifiCorp 230kV transmission line. The potential effects of granting a right-of-way for the transmission line are analyzed and addressed in this EIS.

2.2.8 Applicant-Committed Design Features and Agency-Required Mitigation Measures

To avoid, minimize, and otherwise mitigate impacts on the human and natural environment, the Applicant identified several design features of the Proposed Action for environmental protection that would be implemented for the RRNP. These Applicant-committed measures are part of the Project description and are detailed in their preliminary POD (included as Appendix A of the EIS) and Surface Use Plan for the two injection wells. Table 2-15 is a summation of these Applicant-committed measures, the relevant phase of the Project, and the effectiveness of the measures. The design features of the Proposed Action for environmental protection include BMPs, standard practices, or other procedures employed by the Applicant as standard conduct that contributes to avoiding, minimizing, and reducing over time effects of the Project during construction, operation, and maintenance.

Table 2-16 summarizes the specific design features applicable to pipeline projects from the Wyoming ARMPA for greater sage-grouse (BLM 2015) that would be applied for greater sage-grouse habitat in the Pinedale, Rock Springs, Rawlins, and Casper field offices. However, Greater sage-grouse habitat in the Lander Field Office would be managed by the approved Lander RMP.

In addition, through this environmental review, the BLM and cooperating agencies have identified additional agency-required mitigation measures and other applicable stipulations for avoidance, minimization, and mitigation of the environmental impacts resulting from the implementation of the Project on a resource- or site-specific basis where impacts are anticipated. These measures are presented in Chapter 4 (refer to Table 4-2). The EIS-identified measures would satisfy the requirements of NEPA, as well as BLM's stutary obligations under FLPMA, and also include measures stipulated for resource management in BLM RMPs and other land-use plans, as applicable.

Mitigation elements are categorized into three general types: avoidance; minimization; and other appropriate mitigation, such as compensatory mitigation, for remaining residual impacts. Other appropriate mitigation for residual Project effects is addressed in Section 4.5.

Ultimately, if the Project is approved, the additional mitigation measures identified in the EIS for the selected route would be incorporated into the Applicant's final POD. In turn, the final POD would become a condition of the BLM RODs and an enforceable stipulation of the BLM right-of-way grants and, potentially, other permits.

Table 2-15
Design Features of the Proposed Action for Environmental Protection

	Design Feature	Application Phase[1]			Effectiveness
		Design and Engineering	Construction	Operation and Maintenance	
1.	**Preconstruction Surveys for Sensitive Species** Site-specific surveys and/or monitoring for ESA threatened and endangered species, BLM sensitive species, and other wildlife and fish species would be completed per guidance from the agencies. Survey and monitoring approaches would be developed in coordination with the USFWS, BLM, and WGFD.	✓	✓		While the surveys or the results of the surveys are not measures that avoid, reduce, minimize, or eliminate over time effects on the special status species, the results of the surveys would generate professional recommendations for mitigation and/or conservation measures to protect the species. The resulting mitigation and/or conservation measures would be incorporated into the POD.
2.	**Wildlife and Livestock – Disturbance and Harassment** All employees, contractors, and site visitors would be instructed to avoid harassment and disturbance of wildlife and livestock, especially during reproductive (e.g., courtship and nesting) seasons. During construction, employee pets would not be permitted onsite; during operation, employee pets would be controlled to avoid harassment and disturbance to wildlife and livestock. Applicant to coordinate with grazing allotment permittees to avoid construction to the extent possible during calving and lambing seasons.		✓	✓	Following these guidelines would avoid and minimize disturbance during construction and maintenance activities.
3.	**Wildlife and Livestock – Vehicle Collisions** Project personnel and contractors would be instructed (through training and signage) and required to adhere to 35 miles per hour (mph) speed limit in the Project area to ensure safe and efficient traffic flow and to reduce wildlife and livestock collisions, disturbance, noise and airborne dust.		✓	✓	Slower vehicular-travel speeds allow for decreased noise and increased time for driver response, thereby minimizing the potential for such collisions.

Table 2-15
Design Features of the Proposed Action for Environmental Protection

	Design Feature	Application Phase[1]			Effectiveness
		Design and Engineering	Construction	Operation and Maintenance	
4.	**<u>Sensitive Plant Species Survey</u>** Site-specific surveys for sensitive plant species would be completed prior to ground-disturbing activities in suitable habitat (as determined by the BLM).	✓	✓		While the surveys or the results of the surveys are not measures that avoid, reduce, minimize, or eliminate over time effects on the special status species, the results of the surveys would generate professional recommendations for mitigation and/or conservation measures to protect the species. The resulting mitigation and/or conservation measures would be incorporated into the POD.
5.	**<u>Roads – General Design</u>** Excessive grades on roads, road embankments, ditches, and drainages would be avoided when possible, especially in areas with erodible soils. Special construction techniques would be used, where applicable.	✓	✓		Limiting steep grades and areas that roads are constructed would help in reducing the potential for indirect effects such as damage or loss of vegetation, minimize exposure of soils highly or moderately susceptible to wind or water erosion. These limitations would also minimize potential for increased erosion and sedimentation as a result of soil compaction and/or decompaction would be reduced as well as the loss of soil-stabilizing vegetation.
6.	**<u>Access Roads – General Design</u>** Access roads would be located to follow natural contours where possible and minimize side hill cuts.	✓			Following the existing land contours and terrain minimizes the cutting and filling of slopes and ensures the form and line of the landscape is not visually interrupted. This results in reducing visual contrast between the exposed ground of the road or structure work areas and the surrounding environment. Minimizing slope cut and fill also reduces ground disturbance and potential habitat fragmentation. Water runoff is less likely to accelerate soil erosion, thus minimizing potential damage from rutting and drilling, which, in turn, protects adjacent vegetation.

Table 2-15
Design Features of the Proposed Action for Environmental Protection

	Design Feature	Application Phase[1]			Effectiveness
		Design and Engineering	Construction	Operation and Maintenance	
7.	**Roads – General Use** Traffic would be restricted to the roads developed for the Project. Signs would be placed along construction roads to identify speed limits, travel restrictions, and other standard traffic control information.		✓		Restricting vehicle movement would preclude disturbance outside areas essential for Project-related travel to avoid Project effects outside of the right-of-way: and to reduce livestock mortality.
8.	**Roads Maintenance** All roads would be maintained in a safe and environmentally responsible manner.		✓	✓	This design feature would provide safe conditions for construction and maintenance employees as well as grazing permittees and the general public using any open roadways.
9.	**Roads Reclamation** Abandoned roads and roads that are no longer needed would be recontoured and revegetated.		✓		Closing access roads where they are not needed after construction protects the area resources from further disturbance. The closing of these access roads would restore existing natural features as well as limit public access to wildlife populations, reduce stress, noise and disturbance to wildlife and livestock, special status wildlife and habitats during critical life-cycle periods, anthropogenic disturbance, and traffic; consequently, reducing erosive attributes (e.g., soil compaction, decompaction, rutting). Additionally, visual contrast would be reduced through restoring existing features in naturally intact and highly visible areas.
10.	**Soils – Erosion Control** Permanent erosion control devices would be installed during Project construction and may include waterbars, roadside ditches with subsurface culverts, berms, trash racks on culverts, energy-dissipating structures, mulches, and establishment of permanent vegetation. Erosion controls that comply with county, state, and federal standards would be applied. Practices, such as jute netting, silt fences, and check dams would be applied near disturbed areas. The EI would monitor construction to ensure that erosion control devices are functioning properly.		✓	✓	This practice would reduce and/or minimize potential for additional erosion and introduction of noxious weeds; and increase revegetation success (e.g., forage vegetation and water features for livestock).

Table 2-15
Design Features of the Proposed Action for Environmental Protection

	Design Feature	Application Phase[1]			Effectiveness
		Design and Engineering	Construction	Operation and Maintenance	
11.	**<u>Soils – Topsoil Handling</u>** Topsoil material suitable for site reclamation would be removed in conjunction with clearing and grading and reserved in local stockpiles. Topsoil storage areas would generally be located in staging areas and alongside roadways during construction.		✓		The intent of this procedure is to facilitate reclamation, revegetation and restoration by using the stockpiled native topsoil, and leave the surface in a condition to reduce potential for erosion and better assist revegetation establishment to reduce or eliminate the effects over time (e.g., revegetation of forage for livestock).
12.	**<u>Soils – Wet Soils During Construction</u>** Construction activities would be suspended when soils are wet. Construction would resume when soils become dry enough to support construction equipment. The EI would determine when conditions are too wet to continue.		✓		This would avoid, minimize, and/or reduce potential for impacts on riparian and soil resources by avoiding work in these areas during wet periods and/or by taking measures that would reduce and minimize disturbance of these areas if work in them could not be avoided during wet periods.
13.	**<u>Vegetation – Noxious Weeds</u>** Noxious weed surveys would be conducted to evaluate the presence and extent of noxious weed and invasive species populations in the Project area. Preventative management measures would be applied as warranted pursuant to the Project's Noxious Weed Management Plan. All construction equipment would be power washed and inspected before entering the Project area.		✓	✓	This would avoid, reduce, and/or minimize the potential for spread of noxious weeds through adherence with methods to prevent the transport of these species during construction activities associated with the Project (e.g., reduce spread of noxious weeds in livestock forage vegetation).
14.	**<u>Vegetation – General Maintenance</u>** Once reclamation is complete and vegetation is stable, noxious weed surveys of the Project area would be conducted on a regular basis. Inspection of the Project access roads and internal resource roads would include weed monitoring and treatment, as outlined in the Weed Management Plan.			✓	This would avoid, reduce, and/or minimize the potential for spread of invasive species through adherence with methods to prevent the transport of these invasive species during construction activities associated with the Project (e.g., reduce spread of noxious weeds in livestock forage vegetation).

Table 2-15
Design Features of the Proposed Action for Environmental Protection

	Design Feature	Application Phase[1]			Effectiveness
		Design and Engineering	Construction	Operation and Maintenance	
15.	**<u>Paleontological Mitigation</u>** In consultation with the BLM, specific mitigation measures for treatment of paleontological resources would be developed and implemented to mitigate any identified adverse impacts. These measures would include: ▪ Preparation of a Paleontological Resources Treatment Plan to be incorporated into the POD; ▪ Paleontological surveys of the pipeline route selected for construction, the transmission line, and other Project facilities prior to construction, as directed by the BLM; ▪ Monitoring of ground-disturbing activities at predetermined sites (as determined by the BLM); ▪ Deposition in a paleontological repository; and ▪ Curation.		✓		This procedure would meet the requirements for environmental protection during construction set forth in the POD, with the intent of avoiding, minimizing, reducing, or eliminating effects on paleontological resources.
16.	**<u>Cultural Resources</u>** In consultation with appropriate land-management agencies and the SHPO and in accordance with the Programmatic Agreement (to comply with Section 106 [54 U.S.C. 306108] of the NHPA [54 U.S.C. 300101 et seq.]) entered into between the BLM; the USACE, Omaha District; the NPS, Intermountain Region; the Wyoming SHPO; consulting parties; and tribes, specific mitigation measures for historic properties would be implemented to identify and mitigate adverse effects. These may include Project modifications to avoid adverse effects on historic properties, monitoring of construction activities, and data recovery studies.		✓		The intent is to develop site-specific measures to mitigate adverse effects on historic properties. These may include Project modifications (e.g., selective placement of structures) to avoid adverse effects and monitoring of construction activities to avoid or minimize damage to discoveries and known historic properties.

Table 2-15
Design Features of the Proposed Action for Environmental Protection

	Design Feature	Application Phase[1]			Effectiveness
		Design and Engineering	Construction	Operation and Maintenance	
17.	**<u>Cultural and Paleontological Resources</u>** Regardless of land ownership, unexpected discovery of cultural or paleontological resources during construction would be brought to the attention of the responsible BLM Authorized Officer immediately. Work would be halted in the vicinity of the find to avoid further disturbance to the resources while they are being evaluated and appropriate mitigation measures are being developed.		✓		This procedure would ensure appropriate processes are followed to protect cultural and paleontological resources.
18.	**<u>Visual Resources</u>** Operators would reduce visual impacts during construction by clearly delineating construction boundaries and minimizing areas of ground disturbance; preserving vegetation to the greatest extent possible; stripping, salvaging and replacing topsoil; contoured grading; controlling erosion; using dust suppression techniques as required; and restoring exposed soils and landforms as closely as possible to their original contour and vegetation.		✓		This design feature ensures the form and line of the landscape is not visually interrupted. This results in reducing visual contrast between the exposed ground of the road or structure work areas and the surrounding environment.
19.	**<u>Air Quality – Dust Control</u>** Water would be applied as deemed necessary to all disturbed surfaces (i.e., exposed, dry, and unfrozen) during construction when dust is created by equipment. Magnesium chloride may be applied, after approval by the land manager or landowner, for adequate dust suppression. These treatments would occur on an as-needed basis, depending on weather conditions and the amount of traffic on the road. Speed limits (e.g., 35 MLV) would be enforced along all access roads during construction and maintenance activities to reduce airborne fugitive dust.		✓	✓	This design feature minimizes the dust created by construction equipment. In addition, vehicles traveling at slower speeds generate less dust, reducing Project effects.

Table 2-15
Design Features of the Proposed Action for Environmental Protection

	Design Feature	Application Phase[1]			Effectiveness
		Design and Engineering	Construction	Operation and Maintenance	
20.	**<u>Air and Vehicle Emissions</u>** All construction equipment would be maintained in good working condition and would contain appropriate pollution control devices to minimize trace gas emissions.		✓	✓	The intent is to minimize air emissions associated with construction equipment.
21.	**<u>Mitigation Measure Development</u>** All control and mitigation measures established for the Project in the POD and the management plans that are part of the POD would be maintained and implemented throughout the operational phase, as appropriate. These control and mitigation measures would be reviewed and revised, as needed, based on the mutual agreement of the Applicant and the BLM, to address changing conditions or requirements in the Project area, throughout the operational phase.	✓	✓	✓	These measures, prepared based on requirements from land-management and/or regulatory agencies, would outline the direction for adhering to the requirements during construction, operation, and maintenance of the Project. These measures would contribute to avoiding, minimizing, rectifying, reducing, eliminating, or compensating for effects of the Project on the environment.
22.	**<u>Lands and Realty</u>** All foreign lines would be marked. Monuments and markers (i.e., General Land Surveys and BLM Cadastral Survey Corners, reference corners, U.S. Coastal and Geodetic benchmarks) would be protected during the construction and operational phases of the Project. In the event that a monument or marker is disturbed, the employee would report the incident in writing to the Authorized Officer. The Applicant, in consultation with the BLM or other appropriate agency, would be responsible for resurveying and replacing any markers that are disturbed.		✓		The intent is to ensure monuments and markers are clearly identified and protected to maintain clear land and realty boundaries.

Table 2-15
Design Features of the Proposed Action for Environmental Protection

Design Feature		Application Phase[1]			Effectiveness
		Design and Engineering	Construction	Operation and Maintenance	
23.	**<u>Noise – Construction</u>** All construction equipment would have sound-control devices no less effective than those provided on the original equipment. All construction equipment used would be adequately muffled and maintained. This may include the replacement of standard back-up alarms on design powered construction equipment with approved broadband alarms (to limit alarm noise to 5 to 10 A-weighted decibels (dBA) above the background noise), combination of noisy operations to occur for short durations during the same time periods, and turning idling equipment off.		✓		Implementing sound-control would reduce audible noise that could result in human annoyance and wildlife disturbance.
24.	**<u>Noise – Road Use</u>** Road use specifications designed to keep traffic and vehicle speed to a minimum would be implemented to the maximum extent practical.		✓	✓	Limiting the potential for increased traffic, noise and the associated indirect effects, including the introduction of invasive weeds and special status wildlife habitat fragmentation.
25.	**<u>Waste Management Disposal</u>** Wastes would be properly containerized and removed periodically for disposal at appropriate offsite permitted disposal facilities.		✓	✓	Proper disposal of hazardous materials and construction waste is intended to avoid introduction of such waste into the environment. A Hazardous Materials Management and Spill Prevention, Control and Countermeasure Plan would be completed and be a part of the POD.

Table 2-15
Design Features of the Proposed Action for Environmental Protection

	Design Feature	Application Phase[1]			Effectiveness
		Design and Engineering	Construction	Operation and Maintenance	
26.	**<u>Waste Management Wastewater</u>** Any wastewater generated in association with temporary, portable sanitary facilities would be periodically removed by a licensed hauler and introduced into an existing municipal sewage treatment facility or otherwise disposed of in accordance with applicable state and local laws and regulations. Temporary, portable sanitary facilities provided for construction crews would be adequate to support expected onsite personnel and would be removed at completion of construction activities.		✓	✓	Proper disposal of waste water is intended to avoid introduction of such waste into the environment.
27.	**<u>Water – Stormwater Pollution Prevention Plan</u>** An SWPPP would be developed, submitted for approval, and followed prior to commencement of construction. The SWPPP would describe site-specific erosion control and stream crossing measures that would be implemented during the construction and operation phases of the Project. The Project's SWPPP would be implemented in accordance with WDEQ requirements to obtain National Pollutant Discharge Elimination System compliance under Wyoming's General Permit for Stormwater Discharges Associated with Construction Activity. The EI would direct activities to ensure compliance with the SWPPP.		✓		The intent of an SWPPP is to identify specific BMPs to ensure proper sediment and erosion control and reporting procedures are followed.
28.	**<u>Water– Road Drainage</u>** Whenever possible, existing drainage systems would not be altered, especially in sensitive areas such as erodible soils or steep slopes. Potential soil erosion would be controlled at culvert outlets with appropriate structures. Catch basins, roadway ditches, and culverts would be cleaned and maintained regularly.		✓		This is intended to avoid or minimize damage to water-delivery infrastructure and/or interference with delivery of water.

Table 2-15
Design Features of the Proposed Action for Environmental Protection

	Design Feature	Application Phase[1]			Effectiveness
		Design and Engineering	Construction	Operation and Maintenance	
29.	**<u>Waters – Waterbodies and Wetlands</u>** Water(s) of the U.S., including wetlands, would be avoided to the maximum extent practicable. Where these features cannot be completely avoided, impacts would be minimized through design modification, as needed. Facilities (e.g., flowlines, staging areas) would be sited to avoid and/or minimize impacts; however, where impacts are anticipated, measures would be employed to minimize impacts (e.g., use of culverts to maintain downstream flow/drainage).	✓			Avoiding water courses and wetlands would avoid, minimize and/or reduce potential for impacts on riparian areas and water courses by siting Project facilities outside of these areas (e.g., water sources used by livestock operations).
30.	**<u>Waters – Waterbodies and Wetlands (Construction)</u>** Any construction that occurs in or adjacent to wetlands and streams would use Applicant-committed BMPs listed to protect surface water quality and to minimize impacts on those resources.		✓		This would avoid and minimize potential for impacts on water quality and function by limiting construction activity in sensitive areas (e.g., water sources used by livestock operations).
31.	**<u>Water – Control of Aquatic Invasive Species</u>** Clean all construction equipment that contacts water by using high pressure (minimum 3,000 psi); hot water (140 degrees Fahrenheit). Remove all vegetative matter after constructing through a waterbody that contains water.		✓	✓	This would avoid, reduce, and/or minimize the potential for spread of AISs through adherence with methods to prevent the transport of these invasive species during construction activities associated with the Project.
32.	**<u>Reclamation Roadways</u>** Access roads would be regraded, the topsoil would be replaced, and all disturbed areas would be revegetated. Any roadway damage due to the transport of the heavy equipment would be repaired on the public roadways upon the completion of Project construction.		✓		Reclaiming roadways following construction by rectifying the effects of construction by repairing, rehabilitating, or restoring the affected environment would reduce and eliminate the effects over time.

Table 2-15
Design Features of the Proposed Action for Environmental Protection

	Design Feature	Application Phase[1]			Effectiveness
		Design and Engineering	Construction	Operation and Maintenance	
33.	**<u>Reclamation Public Access</u>** Temporary fencing would be installed around construction areas to limit public access during construction and reclamation of sensitive areas where feasible. Public access to open excavations would be limited by either installation of locked gates at public access points, or utilization of other approved means of limiting public access.		✓		Limiting public access would help in reducing the potential for indirect effects such as damage or loss of vegetation, spread of noxious weeds, harassment of wildlife, vandalism of cultural resources, and disturbance to sensitive land uses (e.g., parks, preservation, and recreation areas and grazing allotments).

NOTE: [1]Design features of the Proposed Action for environmental protection are measures or procedures that are part of the Project description and implemented as standard practice and include measures or procedures that could avoid, minimize, reduce, or rectify (or eliminate over time) adverse impacts. These three columns refer to the phase and/or phases of the Project during which design features are relevant (i.e., during design and engineering, construction, and/or operation and maintenance).

Table 2-16 **Greater Sage-Grouse Design Features**			
Design Features	**Application Phase**		
	Design and Engineering	**Construction**	**Operation and Maintenance**
Evaluate and take advantage of opportunities to remove or modify existing power lines in priority sage-grouse habitat areas. When possible, require perch deterrents on existing or new overhead facilities. Encourage installation of perch deterrents on existing facilities.	✓		
Where existing leases or rights-of-way have had some level of development (road, fence, well, etc.) and are no longer in use, reclaim the site by removing these features and restoring the habitat.	✓		
Locate man camps outside priority sage-grouse habitats.		✓	
Coordinate BMPs and vegetative objectives with the Natural Resources Conservation Service (NRCS) for consistent application across jurisdictions where the BLM and NRCS have the greatest opportunities to benefit Greater Sage-Grouse, particularly as it applies to the NRCS's National Sage-Grouse Initiative.	✓	✓	✓
Evaluate the role of existing seedings that are currently composed of primarily introduced perennial grasses in and adjacent to priority sage-grouse habitats to determine if they should be restored to sagebrush or habitat of higher quality for sage-grouse. If these seedings are part of an Allotment Management Plan/ Conservation Plan, or if they provide value in conserving or enhancing the rest of the priority habitats, then no restoration would be necessary. Assess the compatibility of these seedings for sage-grouse habitat or as a component of a grazing system during land health assessments. For example, some introduced grass seedings are an integral part of a livestock management plan and reduce grazing pressure in important sagebrush habitats, or serve as a strategic fuels management area		✓	✓
Where the federal government owns the surface, and the mineral estate is in non-federal ownership, apply appropriate BMPs to surface development.	✓	✓	✓
Require sage-grouse safe fences.		✓	✓
Design roads to an appropriate standard no higher than necessary to accommodate their intended purpose.	✓		
Locate roads to avoid important areas and habitats.	✓		
Coordinate road construction and use between federal fluid mineral lessees and right-of-way or special-use authorization holders.		✓	
Construct road crossings of ephemeral, intermittent, and perennial streams to minimize impacts on the riparian habitat, such as by crossing at right angles to ephemeral drainages and stream crossings.	✓	✓	
Establish slow speed limits on BLM system-administered roads or design roads for slower vehicle speeds to reduce sage-grouse mortality.		✓	✓
Establish trip restrictions (Lyon and Anderson 2003) or minimization through use of telemetry and remote well control (e.g., SCADA).		✓	✓
Do not issue rights-of-way or special-use authorizations to counties on energy development roads, unless for a temporary use consistent with all other terms and conditions including this document.		✓	✓
Apply dust abatement on roads, well pads, and other ground disturbances.		✓	✓

Table 2-16
Greater Sage-Grouse Design Features

Design Features	Application Phase		
	Design and Engineering	Construction	Operation and Maintenance
Close and rehabilitate duplicate roads by restoring original landform and establishing desirable habitat conditions.		✓	✓
Conduct reclamation on unused roads as soon as possible using appropriate sage-grouse seed mixes.			✓
Reclaim the permitted rights-of-way used in the construction of the running surface immediately.		✓	✓
Site and/or minimize linear rights-of-way or special-use authorizations to reduce disturbance and fragmentation of sagebrush habitats.	✓		
Place new utility developments (power lines, pipelines, etc.) and transportation routes in existing utility or transportation corridors.	✓		
Bury power lines to the extent technically feasible.	✓	✓	
Cover all fluid-containing pits and open tanks with netting (maximum 1.5-inch mesh size) regardless of size to reduce sage-grouse mortality		✓	✓
Equip tanks and other above-ground facilities with structures or devices that discourage nesting and perching of raptors and corvids.	✓	✓	
Control the spread and effects of invasive non-native plant species, including treating weeds prior to ground disturbance and washing vehicles and equipment at designated wash stations when constructing in areas with weed infestations.		✓	✓
Clean up refuse (Bui et al. 2010).		✓	✓
Eliminate sumps; if the sump is absolutely necessary, then construct sage-grouse-safe fences around the sump		✓	✓
Cluster disturbances, operations (hydraulic fracture stimulation, liquids gathering, etc.) and facilities.	✓		
Use directional and horizontal drilling to the extent feasible as a means to reduce ground disturbance in relation to the number of wells.	✓	✓	
Place infrastructure in already disturbed locations where the habitat has not been fully restored.	✓		
Apply a phased development approach with concurrent reclamation.			✓
Place liquid gathering facilities outside priority areas. To reduce truck traffic and perching and nesting sites for ravens and raptors, do not place tanks at well locations in priority habitat areas.	✓	✓	
Pipelines must be under or immediately adjacent to the road (Bui et al. 2010).	✓		
Use remote monitoring techniques for production facilities and develop a plan to reduce the frequency of vehicle use (Lyon and Anderson 2003).		✓	✓
Restrict the construction of tall facilities, distribution power lines, and fences to the minimum number and amount needed.	✓	✓	
Design or site permanent structures to minimize impacts on sage-grouse, with emphasis on locating and operating facilities that create movement (e.g., pump jacks) or attract frequent human use and vehicular traffic (e.g., fluid storage tanks) in a manner that would minimize disturbance of sage-grouse or interference with habitat use	✓		
Use only closed-loop systems for drilling operations, with no reserve pits.	✓		

Table 2-16 **Greater Sage-Grouse Design Features**			
Design Features	**Application Phase**		
	Design and Engineering	**Construction**	**Operation and Maintenance**
Consider using oak (or other material) mats for drilling activities where topography permits to reduce vegetation disturbance and for temporary roads between closely spaced wells to reduce soil compaction and maintain soil structure to increase likelihood of vegetation re-establishment following drilling.		✓	
Artificial water impoundments would be managed for the prevention and/or spread of West Nile virus where the virus poses a threat to sage-grouse. This may include but is not limited to: (a) the use of larvicides and adulticides to treat waterbodies; (b) overbuilding ponds to create non-vegetated, muddy shorelines; (c) building steep shorelines to reduce shallow water and emergent aquatic vegetation; (d) maintaining the water level below rooted vegetation; (e) avoiding flooding terrestrial vegetation in flat terrain or low-lying areas; (f) constructing dams or impoundments that restrict seepage or overflow; (g) lining the channel where discharge water flows into the pond with crushed rock, or use a horizontal pipe to discharge inflow directly into existing open water; (h) lining the overflow spillway with crushed rock and construct the spillway with steep sides to preclude the accumulation of shallow water and vegetation; and (i) restricting access of ponds to livestock and wildlife. This does not apply to naturally occurring waters.		✓	✓
Field offices should consider alternative means to manage produced waters that could present additional vectors for West Nile virus. Such remedies may include re-injection under an approved UIC permit, transfer to single/centralized facility, etc.	✓	✓	
Water impoundments would be managed to prevent the spread of West Nile virus where analysis shows the virus poses a threat to sage-grouse and in consideration of potential negative impact on other species of concern.			✓
Restrict pit and impoundment construction to reduce or eliminate threats from West Nile virus.		✓	
Include objectives for ensuring habitat restoration to meet sage-grouse habitat needs in reclamation practices/sites. Address post reclamation management in reclamation plan such that goals and objectives are to protect and improve sage-grouse habitat needs.	✓		✓
Maximize the area of interim reclamation on long-term access roads and well pads, including reshaping, topsoiling, and revegetating cut-and-fill slopes.			✓
Restore disturbed areas at final reclamation to the predisturbance landforms and desired plant community.		✓	✓
Implement irrigation during interim or final reclamation for sites where establishment of seedlings has been shown or is expected to be difficult due to dry conditions		✓	✓
Use mulching, soil amendments, and/or erosion blankets to expedite reclamation and to protect soils.		✓	✓
Consider potential changes in climate when proposing seedings using native plants. Consider seed collections from the warmer component within a species' current range for selection of native seed.		✓	✓
Use ecological site descriptions or other protocols (e.g., Terrestrial Ecological Unit Inventory or Lands System Inventory to identify the understory species and sagebrush subspecies needed to restore desirable habitat conditions.	✓	✓	

Table 2-16 **Greater Sage-Grouse Design Features**			
Design Features	**Application Phase**		
	Design and Engineering	**Construction**	**Operation and Maintenance**
During vegetation management project design, consider the utility of using livestock to strategically reduce fine fuels, and implement grazing management that would accomplish this objective. Consult with ecologists to minimize impacts on native perennial grasses.	✓		
Provide planning vegetation treatments information to personnel on sage-grouse biology, habitat requirements, and identification of areas utilized locally.	✓		
Use vegetation treatment prescriptions that minimize undesirable effects on vegetation or soils (e.g., minimize mortality of desirable plant species and reduce risk of hydrophobicity).		✓	✓
Ensure that treatments are configured in a manner (e.g., strips) that promotes use by sage-grouse.		✓	✓
Design vegetation treatments in areas of high fire frequency which facilitate firefighter safety, reduce the potential acres burned and the fire risk to sage-grouse habitat. Additionally, develop maps for sage-grouse habitat which spatially display existing fuels treatments that can be used to assist suppression activities.	✓		
Restore prior perennial grass/shrub plant communities infested with invasive species to a species composition characterized by perennial grasses, forbs, and shrubs as outlined in ecological site descriptions.			✓
Emphasize the use of native plant species, recognizing that non-native species may be necessary depending on the availability of native seed and prevailing site conditions.			✓
Reduce the risk of vehicle or human-caused wildfires and the spread of invasive species into sage-grouse habitats. This could be minimized by planting perennial vegetation (e.g., green-strips) paralleling road rights-of-way. (This design feature could be applied to BLM linear right-of-way authorizations.)		✓	✓
Strategically place and maintain pretreated strips/areas (e.g., mowing, herbicide application, and strictly managed grazed strips) to aid in controlling wildfire, should wildfire occur near key habitats or important restoration areas (such as where investments in restoration have already been made).		✓	✓
Design vegetation treatments in sage-grouse habitats to strategically reduce wildfire threats in the greatest area. This may involve spatially arranging new vegetation treatments with past treatments, vegetation with fire-resistant serial stages, natural barriers, and roads in order to constrain fire spread and growth. This may require vegetation treatments to be implemented in a more linear versus block design	✓		✓
Design post-Emergency Stabilization and Rehabilitation and Burn Area Emergency Rehabilitation management to ensure long-term persistence of seeded or preburn native plants. This may require temporary or long-term changes in livestock grazing, wild horses, travel management, etc., to achieve and maintain the desired condition of Emergency Stabilization and Rehabilitation and Burn Area Emergency Rehabilitation projects to benefit sage-grouse. Include sage-grouse habitat parameters as defined by Connelly et al. (2000), Hagen et al. (2007) or if available, state sage-grouse conservation plans and appropriate local information in habitat restoration objectives. Maintain these objectives, in priority sage-grouse habitat areas, as a high restoration priority.	✓		

Table 2-16
Greater Sage-Grouse Design Features

Design Features	Application Phase		
	Design and Engineering	Construction	Operation and Maintenance
Make re-establishment of sagebrush and desirable understory plant cover (relative to ecological site potential) a high priority for restoration efforts. Write specific vegetation objectives to re-establish sagebrush cover and desirable understory cover.			✓
Where applicable, design fuels treatment objective to protect existing sagebrush ecosystems, modify fire behavior, restore native plants, and create landscape patterns which most benefit sage-grouse habitat.	✓		
Provide training to fuels treatment personnel on sage-grouse biology, habitat requirements, and identification of areas utilized locally.			✓
Use burning prescriptions which minimize undesirable effects on vegetation or soils (e.g., minimize mortality of desirable perennial plant species and reduce risk of annual grass invasion).			✓
Ensure proposed sagebrush treatments are planned with full interdisciplinary input from the BLM (pursuant to NEPA) and coordination with state fish and wildlife agencies, and that treatment acreage is conservative in the context of surrounding sage-grouse seasonal habitats and landscape.	✓		
Power-wash all vehicles and equipment involved in vegetation treatment and fuels management activities prior to entering the area to minimize the introduction of undesirable and/or invasive plant species.		✓	✓
Give priority for implementing specific sage-grouse habitat restoration projects in annual grasslands, first to sites which are adjacent to or surrounded by priority habitat or that re-establish continuity between priority habitats. Annual grasslands are a second priority for restoration when the sites are not adjacent to priority habitat but within 2 miles of priority habitat. The third priority for annual grassland habitat restoration projects is sites beyond 2 miles of priority habitat. The intent is to focus restoration outward from existing, intact habitat.		✓	✓
As funding and logistics permit, restore annual grasslands to a species composition characterized by perennial grasses, forbs, and shrubs or one of those referenced in land-use planning documentation.			✓
Emphasize the use of native plant species, recognizing that non-native species may be necessary depending on the availability of native seed and prevailing site conditions.	✓		✓
Remove standing and encroaching trees within at least 110 yards of occupied sage-grouse leks and other habitats (e.g., nesting, wintering, and brood rearing) to reduce the availability of perch sites for avian predators, as resources permit.			✓
Design fuel treatments that would increase fire suppression efficiencies to protect wildland areas from wildfire originating on private lands, infrastructure corridors, and recreational areas. Where applicable, incorporate roads and natural fuel breaks into fuel break design.	✓		
Minimize unnecessary cross-country vehicle travel during fire operations in sage-grouse habitat.		✓	✓

Table 2-16
Greater Sage-Grouse Design Features

Design Features	Application Phase		
	Design and Engineering	Construction	Operation and Maintenance
Make applicable BMPs mandatory as Conditions of Approval in general sage-grouse habitat. BMPs are continuously improving as new science and technology become available and, therefore, are subject to change. At a minimum include the following BMPs: **Roads** ▪ Design roads to an appropriate standard, no higher than necessary, to accommodate their intended purpose. ▪ Do not issue rights-of-way to counties on energy development roads, unless for a temporary use consistent with all other terms and conditions included in this document. ▪ Establish speed limits to reduce vehicle/wildlife collisions or design roads to be driven at slower speeds. ▪ Coordinate road construction and use among right-of-way holders. ▪ Construct road crossing at right angles to ephemeral drainages and stream crossings. ▪ Use dust abatement practices on roads and pads. ▪ Close and reclaim duplicate roads by restoring original landform and establishing desired vegetation. **Operations** ▪ Cluster disturbances, operations (fracture stimulation, liquids gathering, etc.), and facilities. ▪ Use directional and horizontal drilling to reduce ground disturbance. ▪ Clean up refuse (Bui et al. 2010). ▪ Restrict the construction of tall facilities and fences to the minimum number needed. ▪ Cover (e.g., fine mesh netting or use other effective techniques) all drilling and production pits and tanks regardless of size to reduce sage-grouse mortality. ▪ Equip tanks and other above-ground facilities with structures or devices that discourage nesting of raptors and corvids. ▪ Use remote monitoring techniques for production facilities and develop a plan to reduce the frequency of vehicle use. ▪ Control the spread and effects from non-native plant species. (e.g., by washing vehicles and equipment). ▪ Restrict pit and impoundment construction to reduce or eliminate augmenting threats from West Nile virus	✓	✓	✓
Include restoration objectives to meet sage-grouse habitat needs in reclamation practices/sites. Address post-reclamation management in reclamation plan such that goals and objectives are to enhance or restore sage-grouse habitat.			✓

SOURCE: BLM 2015

2.3 Alternatives

2.3.1 No Action Alternative

Under the No Action Alternative, the BLM would reject the Project as proposed and would not issue a right-of-way grant. Without a right-of-way grant across federal lands, the Project could not be constructed due to the federal land ownership patterns in the region. There would be no identifiable impacts on the environmental resources on federal, state, and private lands.

If the Project were not approved, the Applicant or other pipeline proponents may propose projects in the future. Given the market value of the volumes of CO_2 being produced in the region, Denbury or other companies could submit a new right-of-way grant application to the BLM for a different pipeline route. This would initiate a new and separate NEPA process.

2.3.2 Alternative Pipeline Routes

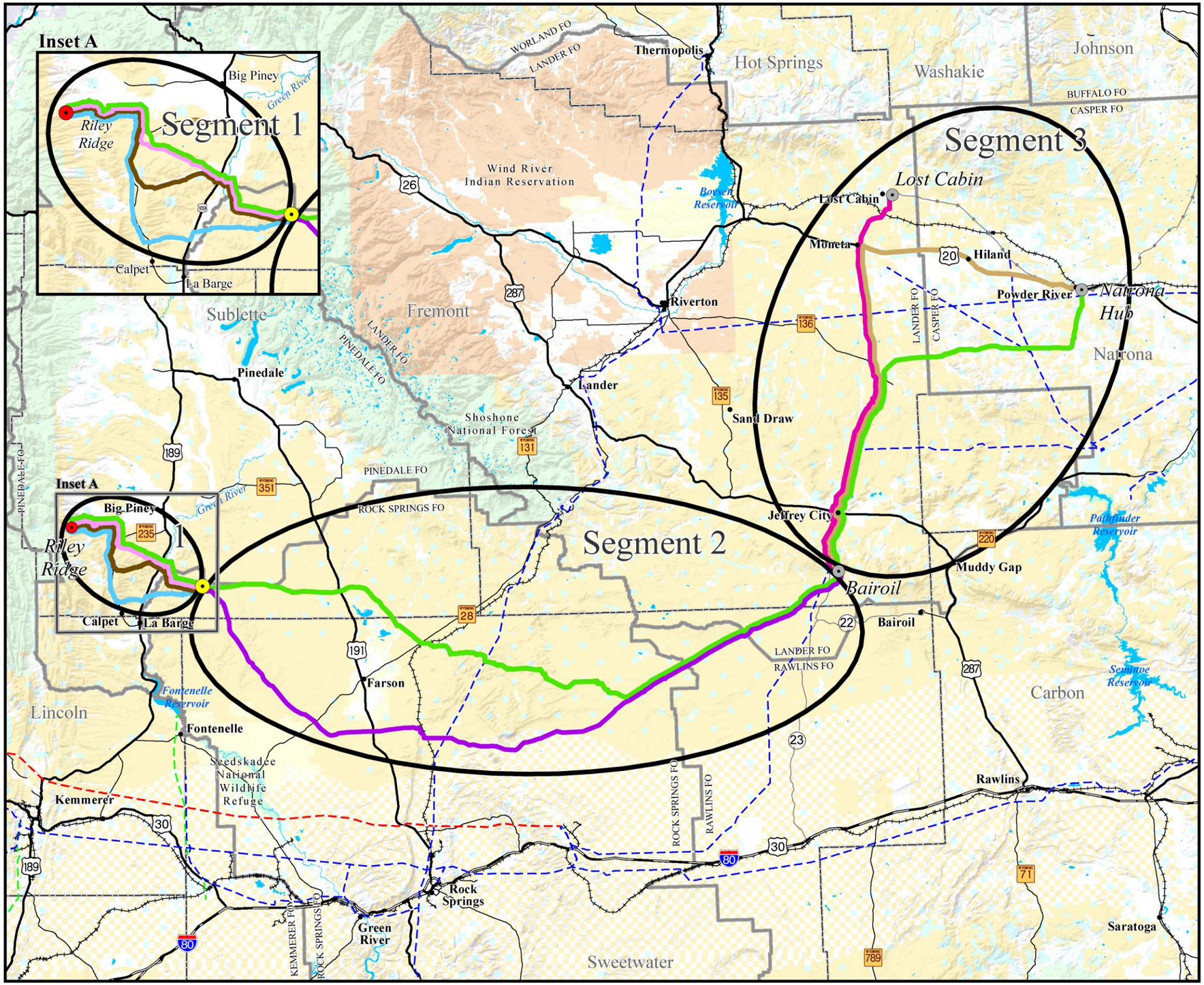
Several alternative pipeline routes were developed for detailed study in the EIS. This section provides a summary of the process used to develop the alternative routes and a general description of the alternative routes. Alternative routes considered but eliminated from detailed analysis are discussed in Section 0.

Alternative route development occurred through two stages: (1) Applicant (Denbury) study of opportunities and resource constraints to identify a Proposed Action, submitted to the BLM in February 2013 as the Proposed Action in the application for right-of-way; (2) agency and public review of the Proposed Action and development of preliminary alternative routes. Section 368 energy corridors (set forth in Section 368 of the Energy Policy Act of 2005) were evaluated as a siting opportunity during alternatives development. In general, the Proposed Action follows existing linear utilities or designated utility corridors to the maximum extent possible. Although not the most direct route, at the time of filing the application for right-of-way, the Applicant believed the pipeline routes included in the Proposed Action avoided many cultural, biological, and engineering constraints posed by routes and was heavily influenced by input the Applicant received from BLM field offices during pre-application meetings held throughout 2012.

Modifications to the preliminary alternative routes were based on comments received from the public, the BLM, and cooperating agencies during the scoping process, which initiated the preparation of this EIS. That is, as a result of concerns and issues identified during scoping, the preliminary routes were refined to establish the network of alternative pipeline routes to be studied and analyzed in the EIS. The pipeline alternative routes analyzed in detail in the EIS are described in this section and presented in Map 2-1. The alternative routes are organized in three primary groupings:

- Segment 1 from the Riley Ridge Treatment Plant to the proposed Riley Ridge Sweetening Plant
- Segment 2 from the proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect
- Segment 3 from the Bairoil Interconnect to the Lost Cabin Interconnect/Natrona Hub Interconnect

A description of each alternative route is presented in this section. Table 2-20 lists jurisdiction and the existing linear facilities that would be parallel to the pipeline along each alternative route. Comparison of the alternative routes is presented in Section 2.4.



Map 2-1
Land Ownership and Alternative Routes

RILEY RIDGE TO NATRONA PROJECT

Alternative Routes[1]

Segment 1
- 1A: Proposed Action
- 1A - Variation: Dry Basin Draw
- 1B: Dry Piney
- 1C: Figure 4

Segment 2
- 2A: Proposed Action
- 2B: Southern Route

Segment 3
- 3A: Proposed Action
- 3B: Lost Creek to Lost Cabin
- 3C: Lost Creek to Highway 20/26

Project Features
- Riley Ridge Treatment Plant
- Interconnect
- Proposed Riley Ridge Sweetening Plant

Land Ownership
- Bureau of Land Management
- Bureau of Reclamation
- Indian Reservation
- U.S. Department of Defense
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- State Land
- Private Land

General Reference
- City or Town
- 345kV Transmission Line
- 230kV Transmission Line
- 138kV Transmission Line
- Greencore Pipeline
- Railroad
- Interstate Highway
- U.S. Highway
- State Highway
- Other Road
- Lake or Reservoir
- County Boundary
- BLM Field Office Boundary

SOURCES:
Land Jurisdiction, BLM 2013; City or Town, ESRI 2013;
BLM Field Office Boundary, BLM 2008;
Transmission Lines and Substations as digitized by EPG, POWERmap Platts 2009;
Highways, Roads, and Railroads, ESRI 2013; Greencore Pipeline, SWCA 2015;
Water Features, ESRI 2008, USGS 2010; State and County Boundaries, ESRI 2013

NOTES:
[1] Preliminary route options are graphically depicted on map and, in some cases, share centerline alignment in common areas.

Last Revised: February 19, 2015
Draft EIS: March 2018

0 5 10 20
Miles

THIS PAGE INTENTIONALLY LEFT BLANK

2.3.2.1 Alternative Routes by Segment

2.3.2.1.1 Segment 1: From the Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

- **Alternative 1A: Proposed Action** is 30.4 miles of 16-inch pipeline beginning at the existing Riley Ridge Treating Plant and extending southeast to the proposed Riley Ridge Sweetening Plant.
- **Alternative 1A Variation: Dry Basin Draw** is a variation to the Proposed Action in the Pinedale Field Office and is approximately 3 miles in length. This variation deviates from the Proposed Action near State Highway 235. This variation was developed to reduce the number of pipeline crossings through the existing B-Unit Wells production field.
- **Alternative 1B: Dry Piney** is an alternative to the Proposed Action in the field office and is approximately 34 miles in length. This alternative route follows the alignment of the Proposed Action from the Riley Ridge Treatment Plant heading east and south until the route diverges from the alignment of the Proposed Action to follow State Highway 235 for about 5 miles and then cuts east to converge again with the Proposed Action near U.S. Route 189. This alternative route was developed to minimize potential impacts on sage-grouse and to avoid conflicts with activities in the existing B-Unit Wells production field.
- **Alternative 1C: Figure Four** is an alternative to the Proposed Action in the Pinedale and Rock Springs field offices and is approximately 38 miles in length. This alternative route follows the same alignment as Alternative 1B: Dry Piney but continues further south along State Highway 235 and then cuts east crossing U.S. Route 189 north of the Town of La Barge and connects to the Proposed Riley Ridge Sweetening Plant. This alternative route follows existing disturbance and is anticipated to minimize potential effects on wildlife more than other alternative routes being considered in this segment.

2.3.2.1.2 Segment 2: From the Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

- **Alternative 2A: Proposed Action** is approximately 129 miles of 24-inch pipeline, which would transport the CO_2 from the Riley Ridge Sweetening Plant eastward. The pipeline would travel east through southern Sublette County crossing into northern Sweetwater County. It would continue southeast across Bush Rim and into the Red Desert, and then turn northeast until it reaches the Bairoil Interconnect about 50 miles northwest of Rawlins, Wyoming.
- **Alternative 2B: Southern Route** is an alternative to the Proposed Action in the Rock Springs, Rawlins, and Lander field offices and is approximately 136 miles in length. This alternative route heads southeast from the Proposed Riley Ridge Sweetening Plant, crossing State Highway 28 and U.S. Route 191 south of Farson, Wyoming. This alternative route then heads northeast where it continues paralleling the Proposed Action to the Bairoil Interconnect. This alternative route was developed to create fewer crossings of NHTs.

2.3.2.2 Segment 3: From the Bairoil Interconnect to the Lost Cabin Interconnect/Natrona Hub Interconnect

- **Alternative 3A: Proposed Action** travels from the Bairoil Interconnect, the pipeline route travels northeast through Fremont County in a designated pipeline corridor, turn easts into Natrona County, and finally north for an additional 83 miles for connection to the Greencore CO_2 Pipeline at the Natrona Hub, which is approximately 30 miles west of Casper, Wyoming.

- **Alternative 3B: Lost Creek to Lost Cabin** is an alternative to the Proposed Action in the Lander Field Office and is approximately 73 miles in length. This alternative route heads northeast from the Bairoil Interconnect crossing U.S. Route 287 and parallels the Proposed Action until it crosses State Highway 136. The alternative route continues north near Moneta, Wyoming, and ties into the Lost Cabin Interconnect near Lost Cabin, Wyoming. This alternative route was developed to utilize a utility corridor designated in the Approved RMP for the Lander Field Office and to tie into the Greencore Pipeline at Lost Cabin versus the Natrona Hub.
- **Alternative 3C: Lost Creek to Highway 20/26** is an alternative to the Proposed Action in the Lander and Casper field offices and is approximately 101 miles in length. This alternative route parallels Alternative 3B: Lost Creek to Lost Cabin until Moneta, Wyoming, where the alternative route diverges and heads east along Highway 20/26 and ties into the Natrona Hub near Powder River, Wyoming. This alternative route was developed to utilize a utility corridor designated in the Approved RMPs for the Lander and Casper field offices.

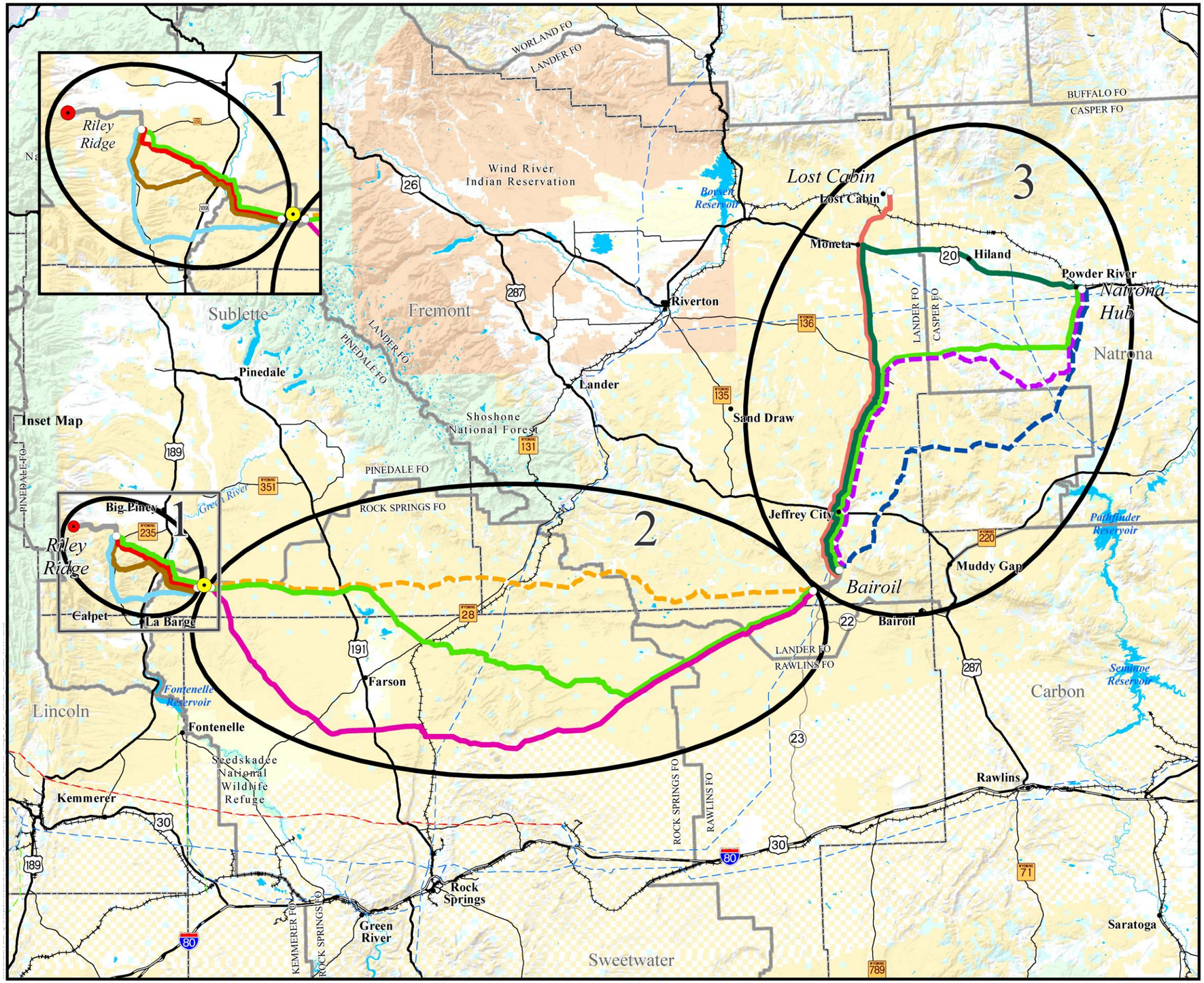
2.3.3 Alternatives Considered but Eliminated from Further Analysis

2.3.3.1 Pipeline Alternative Routes Considered by the BLM

In the preparation of this document, an initial evaluation was made of a full range of alternatives. All reasonable alternative routes were considered, including six route variations to accommodate avoidance measures for sensitive resources. Alternative routes that were (1) ineffective (i.e., did not meet the agency's purpose and need), (2) technically or economically infeasible, (3) inconsistent with the basic policy objectives of the management of an area (e.g., land-use plans), (4) remote or speculative (i.e., could not be analyzed), or (5) substantially similar in design or effects to another alternative route being analyzed were eliminated from further consideration (Map 2-2).

The alternative routes considered and eliminated based on screening are briefly described below:

- **Route Option E: South Pass.** This route option was eliminated from further review because it was inconsistent with basic policy objectives. This route option crosses an exclusion area in the Lander Field Office, a national historic landmark, a Visual Resource Class II area, sage-grouse priority habitat management area (PHMA), four NHTs that share the same alignment (crossed three separate times), and would be inconsistent with the Green River Field Office RMP and Jack Morrow Hills Amendment (Rock Springs Field Office). In May of 2015, Sweetwater County submitted a letter stating the county's preference for Alternative Route E and requesting the BLM analyze the route in detail in the EIS. However, due to the reasons listed above, the BLM believed the route was not feasible and the route remains eliminated from detailed analysis.
- **Route Variation: Poison Spider Road.** This route variation was eliminated because it would be technically infeasible. The route would be congested with multiple rights-of-way, would have limited space for new infrastructure, and would result in substantial challenges for constructability and reclamation.
- **Route Option F: Beef Gap.** This route option was eliminated because the corridor is considered closed in the Lander Field Office RMP because development within the Black Rock designated corridor would not be feasible due to geological resource conflicts (specifically no additional room to site a utility in this corridor).



Map 2-2
Preliminary Route Options Considered and Eliminated from Detailed Analysis

RILEY RIDGE TO NATRONA PROJECT

Route Options

Maintain for Detailed Analysis

Segment 1[1]
- A - Applicant Proposed Route
- B - Dry Piney
- C - Figure 4
- Dry Basin Draw

Segment 2[1]
- A - Applicant Proposed Route
- B - Southern Route

Route Connectors[1]
- Route Connector (Common to all Route options)

Segment 3[1]
- A - Applicant Proposed Route
- Lost Creek to Lost Cabin (Greencore)
- Lost Creek to Highway 20/26

Considered and Eliminated for Detailed Analysis

Segment 2[1]
- E - South Pass

Segment 3 Route Options[1]
- Poison Spider Road
- F - Beef Gap

Project Features
- Riley Ridge Treatment Plant
- Proposed Riley Ridge Sweetening Plant
- Connection Node

Land Ownership
- Bureau of Land Management
- Bureau of Reclamation
- Indian Reservation
- U.S. Department of Defense
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- State Land
- Private Land

General Reference
- City or Town
- 345kV Transmission Line
- 230kV Transmission Line
- 138kV Transmission Line
- Railroad
- Interstate Highway
- U.S. Highway
- State Highway
- Other Road
- Lake or Reservoir
- State Boundary
- County Boundary
- BLM Field Office Boundary

SOURCES:
Land Jurisdiction, BLM 2013; City or Town, ESRI 2013;
BLM Field Office Boundary, BLM 2008
Transmission Lines and Substations as digitized by EPG, POWERmap Platts 2009;
Highways, Roads, and Railroads, ESRI 2013; Water Features, ESRI 2008, USGS 2010;
State and County Boundaries, ESRI 2013

NOTES:
[1] Preliminary route options are graphically depicted on map and, in some cases, share centerline alignment in common areas.

Preliminary Applicant Proposed Route
Options Last Revised: SWCA August 2014
Preliminary BLM Proposed Route Options: EPG January 2015
Last Revised: February 19, 2015
Draft EIS: March 2018

0 5 10 20
Miles

THIS PAGE INTENTIONALLY LEFT BLANK

Pipeline Design Alternative

An aboveground crossing of the pipeline at the Green River was considered as a design alternative to avoid environmental effects on water quality and associated impacts on wildlife and fish if a leak in the pipeline were to occur. However, the CO_2 that would be carried by the pipeline would be in "supercritical" form, which, in the case of a leak, would immediately become a gas and would disperse into the atmosphere. Because the CO_2 would turn into a gas so quickly, no contamination of water resources would be anticipated. The visual effects associated with an aboveground pipeline across the Green River would not be in conformance with the Pinedale RMP. Also, construction of the pipeline aboveground would result in greater surface disturbance than an underground pipeline because concrete pads and piers also would be constructed aboveground to support the pipeline. Finally, there are greater safety concerns associated with an aboveground pipeline, including damage to the pipeline from vandalism or high winds.

The Applicant proposes to use HDD (refer to Section 2.2.3.9) to install the pipeline underneath the Green River at a depth of at least 30 feet below the river bed. The entry and exit points for HDD would be at least ¼ mile from either side of the Green River.

Because the design alternative would be ineffective in avoiding or reducing resource effects and inconsistent with the basic policy objectives of the management of the area, it was eliminated from detailed analysis.

2.4 Comparison of Alternatives

This section summarizes the alternative routes comparison process and results, including determination of the route(s) exhibiting the least impact on the environment overall and the selection of the Agency-Preferred Alternative on federal lands. This section also identifies the pipeline route identified by the Applicant in the Proposed Action.

Table 2-17 through Table 2-19 provide detailed comparative analysis of the resources for each alternative route. For each resource, the tables identify key resource elements and associated impacts. A determination of potential significant impacts remaining after mitigation and cumulative effects (if present) also are identified. Table 2-20 presents the alternative route comparison for utility corridors and jurisdiction for each alternative route. The basis for the information summarized for each resource is contained in Chapters 3 and 4.

2.4.1 Agency Preferred Alternative

The Agency Preferred Alternative on federal lands is the alternative route the BLM, in coordination with the cooperating agencies, believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical, and other factors. DOI regulations at 43 CFR 46.20(d) allow the responsible official to render a decision on a proposed action as long as it is within the range of alternative routes discussed in the relevant environmental document. The decision of the responsible official(s) may combine alternative routes discussed, in the relevant environmental document, if the effects of such combined elements of alternative routes are reasonably apparent from the analysis. The Agency Preferred Alternative for this Project is the combination of Alternative 1C: Figure Four, Alternative 2A: Proposed Action, and Alternative 3B: Lost Creek to Lost Cabin.

The Agency Preferred Alternative was identified by the BLM in coordination with cooperating agencies using criteria based on key resource concerns and issues, regulation and policy, and CEQ regulations for determining significance. The criteria used include the following:

- Maximizes use of existing designated utility corridors by locating within the corridors or paralleling existing linear utility rights-of-way.
- Avoids or minimizes impacts on resources that are regulated by law, after consideration of Project design features and agency BMPs. This includes impacts on greater sage-grouse.
- Avoids or minimizes impacts on resource that demonstrate potentially unavoidable adverse impacts after consideration of design features of the Proposed Action for environmental protection and agency-required mitigation measures, even though those resources may not be regulated by law.
- Minimizes the need for plan amendments through conformance to land-use plans.
- Avoids or minimizes proximity to private residences and residential areas, thereby addressing concerns with public health and safety, aesthetics, visual effects, and others.
- Minimizes use of private lands, assuming natural resource impacts are more or less similar.

If multiple alternative routes meet the preceding criteria, the Agency Preferred Alternative would be the alternative route that minimizes technical constraints; construction, operation, and maintenance expense; and/or time.

In Segment 1, Alternative 1C: Figure Four is an alternative route to the Proposed Action route in the Pinedale and Rock Springs field offices and is approximately 38 miles in length. This alternative route follows the alignment of the Proposed Action from the Riley Ridge Treatment Plant heading east and south until the route diverges from the alignment of the Proposed Action to follow State Highway 235 and then cuts east crossing U.S. Route 189 north of the Town of La Barge and connects to the Proposed Riley Ridge Sweetening Plant. This route follows existing disturbance and avoids the Special Recreation Management Area (SRMA) and VRM Class II areas adjacent to the Green River in the Pinedale Field Office. Also, Alternative 1C: Figure Four would have fewer potential effects on greater sage-grouse than other alternative routes considered and analyzed in this segment.

In Segment 2, Alternative 2A: Proposed Action is approximately 129 miles long. The route begins at the Riley Ridge Sweetening Plant and travels eastward through southern Sublette County, crossing into northern Sweetwater County before continuing southeast across Bush Rim and into the Red Desert, and then turn northeast until it reaches the Bairoil Interconnect about 50 miles northwest of Rawlins, Wyoming. This alternative route avoids the Boar Tusk area and surrounding sacred landscape. Tribal input received from the Northern Arapahoe Tribe of the Wind River Reservation indicates the tribe is not in favor of Alternative 2B: Southern Route because of the proximity to the Boars Tusk. In addition, the Shoshone-Bannock Tribes of the Fort Hall Reservation strongly recommended that no additional access to the Boars Tusk area should be indirectly induced by the Project decision. Alternative 2A: Proposed Action would result in 4.58 percent cumulative disturbance in PHMA. The cumulative disturbance in PHMA for Alternative 2B: Southern Route would be 2.4 percent. Both alternative routes would be under the 5 percent of the DDCT area allowable under the Wyoming ARMPA. The Applicant, BLM, and WGFD worked closely together to identify opportunities to avoid and minimize impacts on PHMA. Residual effects would not inhibit achieving compliance with laws, regulations, and/or policies.

In Segment 3, Alternative 3B: Lost Creek to Lost Cabin is an alternative to the Proposed Action route in the Lander Field Office and is approximately 73 miles in length. This alternative route heads northeast from the Bairoil Interconnect crossing U.S. Route 287 and parallels the Proposed Action route until it crosses State Highway 136. The alternative route continues north near Moneta, Wyoming, and ties into the Lost Cabin Interconnect near Lost Cabin, Wyoming. This route utilizes a utility corridor designated in the Approved RMP for the Lander Field Office and to tie into the Greencore Pipeline at Lost Cabin versus the Natrona Hub.

Table 2-17
Alternative Route Comparison of Resources for Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Resources Analyzed	1A: Proposed Action (30.4 miles)	1A Variation: Dry Basin Draw (30.7 miles)	1B: Dry Piney (34.5 miles)	1C: Figure Four (38.5 miles)
Air quality (including GHGs and climate change) – refer to Section 4.3.1	▪ No high or moderate residual impacts would be anticipated. ▪ Among all alternative routes, the nature of the Proposed Action impacts would be the similar and proportionate to the alternative route length and construction schedule. ▪ Because it is the shortest route, impacts would be the least for 1A: Proposed Action	▪ Similar to 1A: Proposed Action	▪ Similar to 1A: Proposed Action	▪ Similar to 1A: Proposed Action ▪ Because it is the longest route, impacts would be greater than 1A: Proposed Action but not by a significant extent or magnitude
Cultural resources – refer to Section 4.3.2	▪ 154 known sites, including 19 historic properties, would potentially be subject to direct and/or indirect impacts without mitigation (Percentage of cultural resources survey coverage: 30). ▪ Known sites in the direct effects APE: 22, including 3 historic properties (Percentage of cultural resources survey coverage: 45). ▪ Known site density: 2.59 sites per 100 acres. ▪ Known and projected sites: 510 estimated sites, including 63 historic properties. ▪ Known and projected sites in the direct effects APE: 32 estimated sites, including 4 historic properties. ▪ Key resources include the Lander Cutoff of the California NHT and the Opal Wagon Road; the Opal Wagon Road is in the direct effects APE. ▪ An area of Native American concern (Chimney Butte landscape) is in the vicinity of this alternative route. ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.	**1AP Variation: Dry Basin Draw Proposed Action (2.6 miles)** [1] ▪ 29 known sites, including 4 historic properties, would potentially be subject to direct and/or indirect impacts without mitigation (Percentage of cultural resources survey coverage: 96). ▪ Known and projected sites: 30 estimated sites, including 4 historic properties. ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern. **1AV Variation: Dry Basin Draw Variation (2.9 miles)**[1] ▪ 33 known sites, including 3 historic properties, would potentially be subject to direct and/or indirect impacts (Percentage of cultural resources survey coverage: 88). ▪ Known and projected sites: 38 estimated sites, including 3 historic properties. ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.	▪ 152 known sites, including 23 historic properties, would potentially be subject to direct and/or indirect impacts without mitigation (Percentage of cultural resources survey coverage: 49). ▪ Known sites in the direct effects APE: 26, including 5 historic properties (Percentage of cultural resources survey coverage: 41). ▪ Known site density: 1.38 sites per 100 acres. ▪ Known and projected sites: 308 estimated sites, including 47 historic properties. ▪ Known and projected sites in the direct effects APE: 33 estimated sites, including 6 historic properties. ▪ Same key resources as Alternative 1A: Proposed Action; the Opal Wagon Road is in the direct effects APE. ▪ Avoids the Chimney Butte landscape (Native American concern). ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.	▪ 257 known sites, including 53 historic properties, would potentially be subject to direct and/or indirect impacts without mitigation (Percentage of cultural resources survey coverage: 77). ▪ Known sites in the direct effects APE: 34, including 9 historic properties (Percentage of cultural resources survey coverage: 63). ▪ Known site density: 1.35 sites per 100 acres. ▪ Known and projected sites: 334 estimated sites, including 69 historic properties. ▪ Known and projected sites in the direct effects APE: 39 estimated sites, including 10 historic properties. ▪ Same key resources as Alternative 1A: Proposed Action; the Opal Wagon Road is in the direct effects APE. ▪ Avoids the Chimney Butte landscape (Native American concern). ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.
Fish and aquatics – refer to Section 4.3.3	**Aquatic Resources** ▪ No high or moderate residual impacts would be anticipated. ▪ Alternative 1A: Proposed Action avoids direct impacts on the Green River, a red and blue ribbon trout stream, through mitigation, including the use of HDD ▪ Avoids direct impacts on the Muddy Creek/North Piney Creek-Green River or La Barge Creek/Birch Creek-Green River aquatic conservation areas. ▪ No crucial streams are present in Segment 1 **Special Status Species** ▪ Located within a watershed regulated for downstream depletions to the Colorado River to protect federally listed fish species and critical habitat; as proposed: • No water would be removed from the Colorado River system • Any hydrostatic testing water used from permitted contributing sources would be returned to the system in accordance with CWA discharge standards. ▪ No identifiable impacts on federally listed fish species and critical habitat from implementation of the Project would be anticipated.	**Aquatic Resources** ▪ Same as 1A: Proposed Action **Special Status Species** ▪ Same as Alternative 1A: Proposed Action	**Aquatic Resources** ▪ Same as 1A: Proposed Action **Special Status Species** ▪ Same as Alternative 1A: Proposed Action	**Aquatic Resources** ▪ Same as 1A: Proposed Action **Special Status Species** ▪ Same as Alternative 1A: Proposed Action
Geology and topography – refer to Section 4.3.4 and Map Volume (MV)-2, MV-3, and MV-4	**Geology and Topography (including Geohazards)** ▪ Crosses 6.4 miles of areas with high potential for flooding, and 7.6 miles with moderate potential for flooding ▪ Crosses 0.1 mile in areas with high susceptibility to landslides and 1.5 miles with moderate susceptibility to landslides ▪ No Class B faults are crossed by this route. ▪ Construction activities in those areas with identified geological hazards could result in impacts on the Project or could activate landslide areas; however, the Project design and engineering, including design features of the Proposed Action for environmental protection, and agency-required mitigation measures, including micro-siting to avoid sensitive areas to extent practicable and	**Geology and Topography (including Geohazards)** ▪ Similar to 1A: Proposed Action **Mineral Resources** ▪ Would result in 26.9 miles of moderate residual impacts where the alternative route crosses mineral leases. No high residual impacts would be anticipated. ▪ The Applicant must acquire all access permissions for lands outside of their jurisdiction. The BLM expects that the Applicant would resolve any conflicts regarding mineral ownership and access along the selected route, including any compensation for economic impacts on leaseholders etc., through fee mineral and landowner and agreements and permissions	**Geology and Topography (including Geohazards)** ▪ Crosses has 0.5 fewer miles of areas with high potential for flooding and 0.7 fewer miles of areas with moderate potential for flooding than the Alternative 1A: Proposed Action ▪ Alternative 1B: Dry Piney would cross 0.1 more miles of areas with moderate susceptibility to landslides ▪ No Class B faults are crossed by this route. ▪ Construction activities in those areas with identified geological hazards could result in impacts on the Project or could activate landslide areas; however, the Project design and engineering, including design	**Geology and Topography (including Geohazards)** ▪ Crosses 0.1 more miles of areas with high susceptibility to flooding and 0.5 fewer miles with moderate susceptibility to flooding than Alternative 1A: Proposed Action ▪ Crosses 0.8 more miles of areas with moderate potential for landslides and 0.1 fewer miles of areas with high susceptibility to landslides ▪ No Class B faults are crossed by this route. ▪ Construction activities in those areas with identified geological hazards could result in impacts on the Project or could activate landslide areas; however, the Project design and engineering, including design

Table 2-17
Alternative Route Comparison of Resources for Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Resources Analyzed	1A: Proposed Action (30.4 miles)	1A Variation: Dry Basin Draw (30.7 miles)	1B: Dry Piney (34.5 miles)	1C: Figure Four (38.5 miles)
	minimizing construction on greater slopes would avoid, minimize, or reduce residual effects ▪ No high or moderate residual impacts would be anticipated. **Mineral Resources** ▪ Would result in 25.6 miles of moderate residual impacts where the alternative route crosses mineral leases. ▪ The Applicant must acquire all access permissions for lands outside of their jurisdiction. The BLM expects that the Applicant would resolve any conflicts regarding mineral ownership and access along the selected route, including any compensation for economic impacts on leaseholders etc., through fee mineral and landowner and agreements and permissions ▪ No high residual impacts would be anticipated.	▪ No high residual impacts would be anticipated.	features of the Proposed Action for environmental protection, and agency-required mitigation measures, including micro-siting to avoid sensitive areas to extent practicable and minimizing construction on greater slopes would avoid, minimize, or reduce residual effects ▪ No high or moderate residual impacts would be anticipated. **Mineral Resources** ▪ Would result in 28.7 miles of moderate residual impacts where the alternative route crosses mineral leases. No high residual impacts would be anticipated. ▪ The Applicant must acquire all access permissions for lands outside of their jurisdiction. The BLM expects that the Applicant would resolve any conflicts regarding mineral ownership and access along the selected route, including any compensation for economic impacts on leaseholders etc., through fee mineral and landowner and agreements and permissions ▪ No high residual impacts would be anticipated.	features of the Proposed Action for environmental protection, and agency-required mitigation measures, including micro-siting to avoid sensitive areas to extent practicable and minimizing construction on greater slopes would avoid, minimize, or reduce residual effects ▪ No high or moderate residual impacts would be anticipated. **Mineral Resources** ▪ Would result in the greatest extent of impacts (36.8 miles of moderate residual impacts) between 1A: Proposed Action and the other alternative routes considered where the alternative route crosses mineral leases in an area of high oil and gas development activity. ▪ The Applicant must acquire all access permissions for lands outside of their jurisdiction. The BLM expects that the Applicant would resolve any conflicts regarding mineral ownership and access along the selected route, including any compensation for economic impacts on leaseholders etc., through fee mineral and landowner and agreements and permissions ▪ No high residual impacts would be anticipated.
Lands and realty – refer to Section 4.3.5 and MV-5	**Land Jurisdiction and Utility Corridors** ▪ 0.5 mile of moderate residual impacts where the alternative route crosses developed land-use type. ▪ No high or moderate residual impacts would be anticipated. **Authorized Projects** ▪ No high or moderate residual impacts would be anticipated. ▪ Crosses the least amount miles of authorized projects (level of effects primarily related to alternative route length) **Future Land Use** ▪ No high or moderate residual impacts would be anticipated. ▪ Crosses the least number of miles of future land uses (level of effects primarily related to alternative route length)	**Land Jurisdiction and Utility Corridors** ▪ Similar to 1A: Proposed Action **Authorized Projects** ▪ Similar to 1A: Proposed Action **Future Land Use** ▪ Similar to 1A: Proposed Action	**Land Jurisdiction and Utility Corridors** ▪ Similar to 1A: Proposed Action **Authorized Projects** ▪ Similar to 1A: Proposed Action **Future Land Use** ▪ Similar to 1A: Proposed Action	**Land Jurisdiction and Utility Corridors** ▪ Similar to 1A: Proposed Action **Authorized Projects** ▪ Similar to 1A: Proposed Action ▪ Crosses the greatest number of authorized projects among routes considered in the segment (primarily due to greater alternative route length) **Future Land Use** ▪ Similar to 1A: Proposed Action; ▪ Crosses the greatest amount of future land uses among routes considered in the segment (primarily due to greater alternative route length)
Livestock grazing – refer to Section 4.3.6	▪ Crosses 26.8 miles of grazing allotments. ▪ The types of impacts on livestock grazing operations and grazing allotments include temporary and permanent reduction of forage availability in grazing allotments, temporary altering of grazing patterns and locations, temporary reduction in forage species used for livestock grazing, and potential spread of noxious and invasive weeds from construction and maintenance activities. ▪ No high or moderate residual impacts would be anticipated.	Crosses 27.1 miles of grazing allotments. ▪ The types of impacts on livestock grazing operations and grazing allotments include temporary and permanent reduction of forage availability in grazing allotments, temporary altering of grazing patterns and locations, temporary reduction in forage species used for livestock grazing, and potential spread of noxious and invasive weeds from construction and maintenance activities. ▪ No high or moderate residual impacts would be anticipated.	▪ Crosses 30.9 miles of grazing allotments. ▪ The types of impacts on livestock grazing operations and grazing allotments include temporary and permanent reduction of forage availability in grazing allotments, temporary altering of grazing patterns and locations, temporary reduction in forage species used for livestock grazing, and potential spread of noxious and invasive weeds from construction and maintenance activities. ▪ No high or moderate residual impacts would be anticipated.	▪ Crosses 35.0 miles of grazing allotments. ▪ The types of impacts on livestock grazing operations and grazing allotments include temporary and permanent reduction of forage availability in grazing allotments, temporary altering of grazing patterns and locations, temporary reduction in forage species used for livestock grazing, and potential spread of noxious and invasive weeds from construction and maintenance activities. ▪ No high or moderate residual impacts would be anticipated.
National Trails System – refer to Section 4.3.7 and MV-6	▪ No trails are crossed in Segment 1.	▪ No trails are crossed in Segment 1.	▪ No trails are crossed in Segment 1.	▪ No trails are crossed in Segment 1.
Native American concerns – refer to Section 4.3.8	▪ 5 known sites of potential tribal importance would potentially be subject to indirect impacts without mitigation (Percentage of cultural resources survey coverage: 30). ▪ There are no known sites of potential tribal importance in the direct effects APE (Percentage of cultural resources survey coverage: 45). ▪ Known and projected sites of potential tribal importance: 17 estimated sites. ▪ The Chimney Butte landscape.	**1AP Variation: Dry Basin Draw Proposed Action (2.6 miles)** [1] ▪ 2 known sites of potential tribal importance would potentially be subject to direct and/or indirect impacts without mitigation (Percentage of cultural resources survey coverage: 96). ▪ Known and projected sites of potential tribal importance: 2 estimated sites.	▪ 10 known sites of potential tribal importance would potentially be subject to indirect impacts without mitigation (Percentage of cultural resources survey coverage: 49). ▪ There are no known sites of potential tribal importance in the direct effects APE (Percentage of cultural resources survey coverage: 41). ▪ Known and projected sites of potential tribal importance: 20 estimated sites.	▪ 21 known sites of potential tribal importance would potentially be subject to direct and/or indirect impacts without mitigation (Percentage of cultural resources survey coverage: 77). ▪ Known sites of potential tribal importance in the direct effects APE: 2 sites (Percentage of cultural resources survey coverage: 63). ▪ Known and projected sites of potential tribal importance: 27 estimated sites.

Table 2-17
Alternative Route Comparison of Resources for Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Resources Analyzed	1A: Proposed Action (30.4 miles)	1A Variation: Dry Basin Draw (30.7 miles)	1B: Dry Piney (34.5 miles)	1C: Figure Four (38.5 miles)
	▪ The Eastern Shoshone Tribe of the Wind River Reservation expressed concern about boring under the Green River. ▪ The tribes expressed concern about potential effects on natural resources (e.g., wildlife and their habitats, ethnobotanical resources, water) and plant-gathering locations and hunting areas. ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.	▪ The tribes expressed concern about potential effects on natural resources (e.g., wildlife and their habitats, ethnobotanical resources, water) and plant-gathering locations and hunting areas. ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern. **1AV Variation: Dry Basin Draw Variation (2.9 miles)**[1] ▪ 1 known site of potential tribal importance would potentially be subject to direct and/or indirect impacts without mitigation (Percentage of cultural resources survey coverage: 88). ▪ Known and projected sites of potential tribal importance: 1 estimated site. ▪ The tribes expressed concern about potential effects on natural resources (e.g., wildlife and their habitats, ethnobotanical resources, water) and plant-gathering locations and hunting areas. ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.	▪ Avoids the Chimney Butte landscape. ▪ The Eastern Shoshone Tribe of the Wind River Reservation expressed concern about boring under the Green River. ▪ The tribes expressed concern about potential effects on natural resources (e.g., wildlife and their habitats, ethnobotanical resources, water) and plant-gathering locations and hunting areas. ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.	▪ Known and projected sites of potential tribal importance in the direct effects APE: 2 estimated sites. ▪ Avoids the Chimney Butte landscape. ▪ The Eastern Shoshone Tribe of the Wind River Reservation expressed concern about boring under the Green River. ▪ The tribes expressed concern about potential effects on natural resources (e.g., wildlife and their habitats, ethnobotanical resources, water) and plant-gathering locations and hunting areas. ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.
Noise – refer to Section 4.3.9	▪ Noise from construction of the Proposed Riley Ridge Sweetening Plant would be clearly audible within approximately 3.8 miles of the site but occasionally audible at greater distances when not masked by other manmade or natural noise sources ▪ Proposed Riley Ridge Sweetening Plant operations would directly change the acoustical environment with moderate residual impacts on wildlife living or migrating within 0.9 mile ▪ Noise from pipeline construction (without HDD) would be clearly audible within 1.8 miles of the equipment when not masked by other manmade or natural noise sources. ▪ Construction and HDD noise would be temporary and short term, and no residual noise effects would be anticipated for human or wildlife receptors due to distance to receptor and seasonal restrictions).	▪ Same as 1A: Proposed Action	▪ Same as 1A: Proposed Action	▪ Same as 1A: Proposed Action
Lands with wilderness characteristics – refer to Section 4.3.10 and MV-7	▪ No lands with wilderness characteristics are crossed in Segment 1.	▪ No lands with wilderness characteristics are crossed in Segment 1.	▪ No lands with wilderness characteristics are crossed in Segment 1.	▪ No lands with wilderness characteristics are crossed in Segment 1.
Paleontological resources – refer to Section 4.3.11 and MV-8	▪ Crosses 23.1 miles of geological units with PFYC 5; as part of the design features of the Proposed Action for environmental protection, paleontological monitors would be present during construction activities in areas having PFYCs of 3 to 5 ▪ Crosses zero miles of geological units with PFYC of 3 or 4 ▪ No high or moderate residual impacts would be anticipated.	▪ Crosses 24.7 miles of geological units with PFYC 5; as part of the design features of the Proposed Action for environmental protection, paleontological monitors would be present during construction activities in areas having PFYCs of 3 to 5 ▪ Crosses zero miles of geological units with PFYC of 3 or 4 ▪ No high or moderate residual impacts would be anticipated.	▪ Crosses 27.5 miles of geological units with PFYC 5; as part of the design features of the Proposed Action for environmental protection, paleontological monitors would be present during construction activities in areas having PFYCs of 3 to 5. ▪ Crosses zero miles of geological units with PFYC of 3 or 4 ▪ No high or moderate residual impacts would be anticipated.	▪ Crosses 31.7 miles of geological units with PFYC 5; as part of the design features of the Proposed Action for environmental protection, paleontological monitors would be present during construction activities in areas having PFYCs of 3 to 5. ▪ Crosses zero miles of geological units with PFYC 4 ▪ No high or moderate residual impacts would be anticipated.
Public health and safety – refer to Section 4.3.12	▪ No high or moderate residual impacts would be anticipated. Impacts from the proposed pipeline would be the same across all alternative routes.	▪ Same as 1A: Proposed Action	▪ Same as 1A: Proposed Action	▪ Same as 1A: Proposed Action
Recreation – refer to Section 4.3.13 and MV-5	▪ Crosses 1 mile of the Green and New Fork Rivers-Lower Zone SRMA ▪ Would impede access to one recreation site during construction	▪ Same as 1A: Proposed Action	▪ Same as 1A: Proposed Action	▪ Does not cross SRMAs, Extensive Recreation Management Areas (ERMA), recreation sites or trails
Social and economic conditions – refer to Section 4.3.14	**Employment Effects** ▪ 108 direct and indirect short-term jobs during construction; 34 direct and indirect long-term jobs during operations **Property Values** ▪ Potential zero to 3 percent reduction in property values within 3 miles of H_2S pipeline. 3 miles of private land crossed by pipeline	**Employment Effects** ▪ Same as Alternative 1A: Proposed Action **Property Values** ▪ Same as Proposed Action **Property Tax Revenues** ▪ Same as Proposed Action	**Employment Effects** ▪ Same as Alternative 1A: Proposed Action **Property Values** ▪ Potential zero to 3 percent reduction in property values within 3 miles of H_2S pipeline. 7 miles of private land crossed by pipeline	**Employment Effects** ▪ Same as Alternative 1A: Proposed Action **Property Values** ▪ Potential zero to 3 percent reduction in property values within 3 miles of H_2S pipeline. 3 miles of private land crossed by pipeline

Table 2-17
Alternative Route Comparison of Resources for Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Resources Analyzed	1A: Proposed Action (30.4 miles)	1A Variation: Dry Basin Draw (30.7 miles)	1B: Dry Piney (34.5 miles)	1C: Figure Four (38.5 miles)
	Property Tax Revenues ▪ Estimated $33 million in local property tax revenues over 50-year life of Project **Environmental Justice** ▪ No disparate impacts on environmental justice populations would occur.	**Environmental Justice** ▪ Samea s Proposed Action	**Property Tax Revenues** ▪ Estimated $35 million in local property tax revenues over 50-year life of Project **Environmental Justice** ▪ Samea s Proposed Action	**Property Tax Revenues** ▪ Estimated $36 million in local property tax revenues over 50-year life of Project **Environmental Justice** ▪ Samea s Proposed Action
Soils and reclamation – refer to Section 4.3.15 and MV-9	▪ Would result in the least amount of permanent and temporary disturbance to soils with moderate and high susceptibility to wind erosion ▪ Alternative 1A: Proposed Action (and the 1A Variation) cross fewer soils with moderate or low reclamation potential (approximately 7 miles less than Alternative 1C: Figure Four) that would require more mitigation to avoid soil loss and to achieve reclamation success ▪ Alternative 1A: Proposed Action the shortest route considered in this segment, which is preferable in terms of reclamation success. ▪ With appropriate level of mitigation, no high or moderate residual impacts would be anticipated.	▪ Similar to 1A: Proposed Action	▪ Would result in the greatest amount of permanent and temporary disturbance to soils susceptibility to water erosion ▪ Would result in most disturbance to soils with high compaction potential ▪ Alternative 1B: Dry Piney (and Alternative 1C: Figure Four) crosses the greater amount of soils with moderate and low reclamation potential than the Proposed Action and would require the most mitigation to avoid soil loss and to achieve reclamation success. ▪ With appropriate level of mitigation, no high or moderate residual impacts would be anticipated.	▪ Alternative 1C: Figure 4 (and Alternative 1B: Dry Piney) crosses the greatest amount of soils with moderate and low reclamation potential and would require the most mitigation to avoid soil loss and to achieve reclamation success. ▪ With appropriate level of mitigation, no high or moderate residual impacts would be anticipated.
Special designations – refer to Section 4.3.16 and MV-7	▪ No special designation crossed in Segment 1.	▪ No special designation crossed in Segment 1.	▪ No special designation crossed in Segment 1.	▪ No special designation crossed in Segment 1.
Transportation – refer to Section 4.3.17 and MV-5	▪ No high or moderate residual impacts would be anticipated. ▪ Impacts from the proposed pipeline would be the same across all alternative routes.	▪ Same as 1A: Proposed Action	▪ Same as 1A: Proposed Action	▪ Same as 1A: Proposed Action
Vegetation – refer to Section 4.3.18 and MV-10	**Vegetation** ▪ Would result in 0.4 mile of moderate residual impacts on vegetation resources as a result of ground disturbances on vegetation communities due to vegetation clearing and the potential for introduction of invasive and noxious weeds ▪ No high residual impacts would be anticipated. **Special Status Plants** ▪ No modeled habitat for Ute ladies'-tresses modeled habitat crossed in Segment 1.	**Vegetation** ▪ Same as Alternative 1A: Proposed Action ▪ No high residual impacts would be anticipated. **Special Status Plants** ▪ Same as Alternative 1A: Proposed Action	**Vegetation** ▪ Would result in 0.6 mile of moderate residual impacts on vegetation resources as a result of ground disturbances on vegetation communities due to vegetation clearing and the potential for introduction of invasive and noxious weeds ▪ No high residual impacts would be anticipated. **Special Status Plants** ▪ Same as Alternative 1A: Proposed Action	**Vegetation** ▪ Would result in 0.7 mile of moderate residual impacts on vegetation resources as a result of ground disturbances on vegetation communities due to vegetation clearing and the potential for introduction of invasive and noxious weeds ▪ No high residual impact would be anticipated. **Special Status Plants** ▪ Same as Alternative 1A: Proposed Action
Visual resources – refer to Section 4.3.19 and MV-11	**Scenery** ▪ Crosses the Green River in generally unmodified setting; through application of agency-required mitigation measures, including boring under the river and riparian vegetation, the effects on views would be minimized to the extent practicable. ▪ 4.0 miles of moderate residual impacts in the Wyoming Foothills (Class A) and Class B landscapes including the Lower Green River. ▪ No high residual impacts would be anticipated. **Views** ▪ 2.8 miles of moderate residual impacts in proximity to the Green River. No high residual impacts would be anticipated. ▪ Views between 0.0 to 0.5 mile away: 1.5 miles ▪ Views between 0.5 to 1.0 mile away: 2.2 miles **Compliance** ▪ Compliant with BLM VRM Class II, III, and IV objectives	**Scenery** ▪ Same as Alternative 1A: Proposed Action **Views** ▪ Same as Alternative 1A: Proposed Action **Compliance** ▪ Same as Alternative 1A: Proposed Action	▪ Same as Alternative 1A: Proposed Action **Views** ▪ Same as Alternative 1A: Proposed Action **Compliance** ▪ Same as Alternative 1A: Proposed Action	**Scenery** ▪ Crosses the Green River in generally unmodified setting; through application of agency-required mitigation measures, including boring under the river and riparian vegetation, the effects on views would be minimized to the extent practicable. ▪ 2.6 miles of moderate in the Wyoming Foothills (Class A) and Class B landscapes including the Lower Green River. ▪ No high residual impacts would be anticipated. **Views** ▪ 1.4 miles of moderate residual impacts in proximity to the Green River. No high residual impacts would be anticipated. ▪ Views between 0.0 to 0.5 mile away: 1.3 miles ▪ Views between 0.5 to 1.0 mile away: 2.6 miles **Compliance** ▪ Compliant with BLM VRM Class II, III, and IV objectives
Water resources – refer to Section 4.3.20 and MV-12	**Surface Water** ▪ Crosses 30.4 miles of surface water resources, including 5.2 miles of intermittent streams and 0.9 mile of perennial streams. ▪ Only low impacts on 6.1 miles (intermittent and perennial streams) would be anticipated after application of agency-required mitigation	**Surface Water** ▪ Crosses 0.9 more miles of intermittent waters than Alternative 1A: Proposed Action and the same extent of perennial water resources ▪ Only low impacts on 7.0 miles (intermittent and perennial streams) would be anticipated after	**Surface Water** ▪ Crosses 1.5 more miles of intermittent surface waters and 0.2 mile of perennial surface waters than Alternative 1A: Proposed Action ▪ Only low impacts on 8.0 miles (intermittent and perennial streams) would be anticipated after	**Surface Water** ▪ Crosses 3.8 more miles of intermittent streams and 0.1 more mile of perennial stream than Alternative 1A: Proposed Action. ▪ Only low impacts on 10.5 miles (intermittent and perennial streams) would be anticipated after

Table 2-17
Alternative Route Comparison of Resources for Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Resources Analyzed	1A: Proposed Action (30.4 miles)	1A Variation: Dry Basin Draw (30.7 miles)	1B: Dry Piney (34.5 miles)	1C: Figure Four (38.5 miles)
	micro-siting to avoid the streams to the extent possible and minimizing disturbance within 500 feet (153 meters) of streams ▪ No waters crossed by alternative routes in Segment 1 are listed on the CWA 303(d) list of impaired waters by the WDEQ. **Groundwater** ▪ Two springs are located near MP 1 and MP 5 ▪ No designated drinking water supplies, sole aquifers, wellhead protection zones, or other public drinking water supply resources ▪ Agency-required mitigation measures applied to pipeline would include micro-siting to avoid springs or minimization of disturbance and intense reclamation to avoid construction-caused hydrologic alterations or disruptions ▪ Operational emergency responses would be conducted in accordance with USDOT PHMSA requirements. ▪ No high or moderate residual impacts would be anticipated	application of agency-required mitigation micro-siting to avoid the streams to the extent possible and minimizing disturbance within 500 feet (153 meters) of streams ▪ No waters crossed by alternative routes in Segment 1 are listed on the CWA 303(d) list of impaired waters by the WDEQ. **Groundwater** ▪ No springs, designated drinking water supplies, sole aquifers, wellhead protection zones, or other public drinking water supply resources ▪ No impacts would be anticipated	application of agency-required mitigation micro-siting to avoid the streams to the extent possible and minimizing disturbance within 500 feet (153 meters) of streams ▪ No waters crossed by alternative routes in Segment 1 are listed on the CWA 303(d) list of impaired waters by the WDEQ. **Groundwater** ▪ No springs, designated drinking water supplies, sole aquifers, wellhead protection zones, or other public drinking water supply resources ▪ No impacts would be anticipated	application of agency-required mitigation micro-siting to avoid the streams to the extent possible and minimizing disturbance within 500 feet (153 meters) of streams ▪ No waters crossed by alternative routes in Segment 1 are listed on the CWA 303(d) list of impaired waters by the WDEQ. **Groundwater** ▪ Four springs are located near MP 1 and 4 and two springs are located near MP 2 ▪ No designated drinking water supplies, sole aquifers, wellhead protection zones, or other public drinking water supply resources ▪ Agency-required mitigation measures applied to pipeline would include micro-siting to avoid springs or minimization of disturbance and intense reclamation to avoid construction-caused hydrologic alterations or disruptions ▪ Operational emergency responses would be conducted in accordance with USDOT PHMSA requirements. ▪ No high or moderate residual impacts would be anticipated
Wetlands and riparian areas – refer to Section 4.3.21	**Wetlands** ▪ Crosses 0.2 mile of palustrine emergent and 0.5 mile of palustrine forested/shrub wetlands ▪ Would result in temporary disturbance of approximately 2 acres for palustrine emergent and 6 acres of palustrine forested/shrub wetlands and more than 1 acre and 3 acres of permanent disturbance, respectively **Riparian Areas** ▪ Route crosses 0.3 mile of riparian areas ▪ Without mitigation, would result in temporary disturbance of approximately 4 acres and 2 acres of permanent disturbance to riparian areas ▪ Agency-required mitigation measures applied to pipeline would include avoiding riparian areas at the Green River by HDD, minimizing disturbance within 500 feet (153 meters) of streams, and minimizing the removal of trees in riparian areas ▪ No high or moderate residual impacts would be anticipated	**Wetlands** ▪ Same as Alternative 1A: Proposed Action **Riparian Areas** ▪ Same as Alternative 1A: Proposed Action	**Wetlands** ▪ Same as Alternative 1A: Proposed Action **Riparian Areas** ▪ Same as Alternative 1A: Proposed Action	**Wetlands** ▪ Crosses 0.6 more miles of palustrine emergent and 0.4 less miles of palustrine forested/shrub wetlands than Alternative 1A: Proposed Action ▪ Would result in temporary disturbance of 8 more acres for palustrine emergent and 5 less acres of palustrine forested/shrub wetlands and 5 more acres and 2 less acres of permanent disturbance, respectively, than Alternative 1A: Proposed Action **Riparian Areas** ▪ Route crosses 0.6 more miles of riparian areas than Alternative 1A: Proposed Action ▪ Without mitigation, would result less temporary and permanent disturbance to riparian areas ▪ Agency-required mitigation measures applied to pipeline would include avoiding riparian areas at the Green River by HDD, minimizing disturbance within 500 feet (153 meters) of streams, and minimizing the removal of trees in riparian areas ▪ No high or moderate residual impacts would be anticipated.
Wild horses and burros – refer to Section 4.3.22 and MV-7	▪ Crosses 8 miles of Herd Management Area (HMA) ▪ No high or moderate residual impacts would be anticipated.	▪ Same as Alternative 1A: Proposed Action	▪ Same as Alternative 1A: Proposed Action	▪ Crosses 9.4 miles of HMA ▪ No high or moderate residual impacts would be anticipated.
Wildlife – refer to Section 4.3.23 and MV-13 through MV-15	**Big Game** ▪ Would result in low impacts on 20.5 miles of big game range, migration corridors, and parturition areas, including 0.6 mile of the Red Desert to Hoback mule deer migration corridor (the least among the routes considered in the segment) ▪ No high or moderate residual impacts would be anticipated. **Migratory Birds and Bald and Golden Eagles** ▪ Would result in low impacts on 30.3 miles of eagle habitat because seasonal restrictions would minimize moderate or high impacts on bald and golden eagles.	**Big Game** ▪ Would result in low impacts on 20.6 miles of big game range, migration corridors, and parturition areas ▪ No high or moderate residual impacts would be anticipated. **Migratory Birds and Bald and Golden Eagles** ▪ Would result in low impacts on 30.6 miles of eagle habitat because seasonal restrictions would minimize moderate or high impacts on bald and golden eagles.	**Big Game** ▪ Would result in low impacts on 15.2 miles of big game range, migration corridors, and parturition areas ▪ No high or moderate residual impacts would be anticipated. **Migratory Birds and Bald and Golden Eagles** ▪ Would result in low impacts on 34.0 miles of eagle habitat because seasonal restrictions would minimize moderate or high impacts on bald and golden eagles.	**Big Game** ▪ Would result in low impacts on 15.4 miles of big game range, migration corridors, and parturition areas, including 2.3 miles of the Red Desert to Hoback mule deer migration corridor (the most among the routes considered in the segment) ▪ No high or moderate residual impacts would be anticipated. **Migratory Birds and Bald and Golden Eagles**

Table 2-17
Alternative Route Comparison of Resources for Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Resources Analyzed	1A: Proposed Action (30.4 miles)	1A Variation: Dry Basin Draw (30.7 miles)	1B: Dry Piney (34.5 miles)	1C: Figure Four (38.5 miles)
	▪ Preconstruction surveys would identify the most recent nest activity status, new nests, and any additional mitigation modifications needed to minimize impacts. ▪ Route crosses suitable migratory bird habitat, in particular for sagebrush bird assemblages; however, impacts on migratory birds would be anticipated to be low as construction would avoid the migratory bird nesting period; also, avoidance and intense reclamation of riparian habitats and wetlands, areas generally important to migratory birds, would be required, which would minimize effects on migratory birds ▪ No high or moderate residual impacts would be anticipated. **Endangered Species Act-Listed Species** ▪ Crosses potential yellow-billed cuckoo habitat ▪ Located north of USFWS proposed critical habitat; the riparian habitat present is not thought to be suitable for nesting habitat. ▪ Surveys for suitable nesting habitat would be conducted prior to construction for the selected route and if suitable nesting habitat is present, field surveys for yellow-billed cuckoo would be conducted. If yellow-billed cuckoo were found to be present, seasonal restrictions would be determined through the USFWS Section 7 consultation. In addition, the Applicant proposed the use of HDD to avoid disturbance riparian habitat on both sides of the river. ▪ Crosses areas included in the USFWS-mapped Area of Influence (AOI) for Canada lynx. However, the Canada lynx are primarily found in high-elevation coniferous forest and the Project does not cross any areas known or likely to be occupied by resident Canada lynx. **Greater Sage-Grouse** ▪ Would result in moderate impacts on 30.4 miles of General Habitat Management Area (GHMA) ▪ No PHMA or Sagebrush Focal Areas (SFA) would be affected ▪ The cumulative disturbance in PHMA would be under the 5 percent of the DDCT area allowable under the Wyoming ARMPA	▪ Preconstruction surveys would identify the most recent nest activity status, new nests, and any additional mitigation modifications needed to minimize impacts. ▪ Route crosses suitable migratory bird habitat, in particular for sagebrush bird assemblages; however, impacts on migratory birds would be anticipated to be low as construction would avoid the migratory bird nesting period; also, avoidance and intense reclamation of riparian habitats and wetlands, areas generally important to migratory birds, would be required, which would minimize effects on migratory birds ▪ No high or moderate residual impacts would be anticipated. **Endangered Species Act-Listed Species** ▪ Same as Alternative 1A: Proposed Action **Greater Sage-Grouse** ▪ Would result in moderate impacts on 30.7 miles of GHMA ▪ No PHMA or SFAs would be affected ▪ The cumulative disturbance in PHMA would be under the 5 percent of the DDCT area allowable under the Wyoming ARMPA	▪ Preconstruction surveys would identify the most recent nest activity status, new nests, and any additional mitigation modifications needed to minimize impacts. ▪ Route crosses suitable migratory bird habitat, in particular for sagebrush bird assemblages; however, impacts on migratory birds would be anticipated to be low as construction would avoid the migratory bird nesting period; also, avoidance and intense reclamation of riparian habitats and wetlands, areas generally important to migratory birds, would be required, which would minimize effects on migratory birds ▪ No high or moderate residual impacts would be anticipated. **Endangered Species Act-Listed Species** Same as Alternative 1A: Proposed Action **Greater Sage-Grouse** ▪ Would result in moderate impacts on 34.5 miles of GHMA ▪ No PHMA or SFAs would be affected ▪ The cumulative disturbance in PHMA would be under the 5 percent of the DDCT area allowable under the Wyoming ARMPA	▪ Would result in low impacts on 37.7 miles of eagle habitat because seasonal restrictions would minimize moderate or high impacts on bald and golden eagles. ▪ Preconstruction surveys would identify the most recent nest activity status, new nests, and any additional mitigation modifications needed to minimize impacts. ▪ Route crosses suitable migratory bird habitat, in particular for sagebrush bird assemblages; however, impacts on migratory birds would be anticipated to be low as construction would avoid the migratory bird nesting period; also, avoidance and intense reclamation of riparian habitats and wetlands, areas generally important to migratory birds, would be required, which would minimize effects on migratory birds ▪ No high or moderate residual impacts would be anticipated. **Endangered Species Act-Listed Species** ▪ Same as Alternative 1A: Proposed Action **Greater Sage-Grouse** ▪ Would result in moderate impacts on 38.5 miles of GHMA ▪ No PHMA or SFAs would be affected ▪ The cumulative disturbance in PHMA would be under the 5 percent of the DDCT area allowable under the Wyoming ARMPA

NOTE: [1]As per cultural analysis presented in Ollie et al. 2016.

Table 2-18
Alternative Route Comparison of Resources for Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Resources Analyzed	2A: Proposed Action (129.1 miles)	2B: Southern Route (136.2 miles)
Air quality (including GHGs and climate change) – refer to Section 4.3.1	▪ No high or moderate residual impacts would be anticipated. ▪ Among all alternative routes, the nature of the Proposed Action impacts would be the similar and proportionate to the alternative route length and construction schedule. ▪ Because it is the shortest route, impacts would be the least for 2A: Proposed Action	▪ Similar to Alternative 2A: Proposed Action ▪ Because it is the longest route, impacts would be greater than 2A: Proposed Action but not by a significant extent or magnitude
Cultural resources – refer to Section 4.3.2	▪ 236 known sites, including 57 historic properties, would potentially be subject to direct and/or indirect impacts (Percentage of cultural resources survey coverage: 6). ▪ Known sites in the direct effects APE: 81, including 28 historic properties (Percentage of cultural resources survey coverage: 23). ▪ Known site density: 4.57 sites per 100 acres. ▪ Known and projected sites: 3,785 estimated sites, including 914 historic properties. ▪ Known and Projected sites in the direct effects APE: 192 estimated sites, including 66 historic properties. ▪ Key resources include the NRHP-listed Arapahoe and Lost Creek Site (48SW4882), the Sublette Cutoff of the California NHT, the Emigrant NHTs[1], the Little Sandy Crossing and the North Sublette Meadow Springs variant of the Sublette Cutoff, the Point of Rocks to South Pass Road, the Bryan to South Pass Stage Road, and the Parting of the Ways (48SW4198); the NRHP-listed Arapahoe and Lost Creek Site (48SW4882) and contributing segments of the linear sites are in the direct effects APE. ▪ An additional key resource, specific to Alternative 2A: Proposed Action is the Teakettle Dune Filed (indirect effects APE). ▪ Potential to directly affect unrecorded, significant sites that may exist in the Jack Morrow Hills area. ▪ Avoids the Boars Tusk (Native American Concern). ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.	▪ 235 known sites, including 67 historic properties, would potentially be subject to direct and/or indirect impacts (Percentage of cultural resources survey coverage: 8). ▪ Known sites in the direct effects APE: 90, including 31 historic properties (Percentage of cultural resources survey coverage: 17). ▪ Known site density: 3.54 sites per 100 acres. ▪ Known and projected sites: 3,094 estimated sites, including 882 estimated historic properties. ▪ Known and projected sites in the direct effects APE: 187 estimated sites, including 64 historic properties. ▪ Same key resources as Alternative 2A: Proposed Action, except for the Little Sandy Crossing and the North Sublette Meadow Springs variant of the Sublette Cutoff and the Parting of the Ways (48SW4198). ▪ Specific to this alternative route are the Boars Tusk (Native American Concern), two NHT-associated sites (Simpson's Hollow and Mormon Knolls), the West Sand Dunes Archaeological District[2], and the Greater Sand Dunes ACEC; the NRHP-listed Arapahoe and Lost Creek Site (48SW4882), the Greater Sand Dunes ACEC, and contributing segments of the linear sites are in the direct effects APE. ▪ White Mountain Petroglyphs ACEC is located 4 miles to the south of this alternative route. ▪ Avoids the Teakettle Dune Field. ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.
Fish and aquatics – refer to Section 4.3.3	**Aquatic Resources** ▪ Alternative 2A: Proposed Action avoids direct impacts on the Big Sandy River, a crucial stream, through mitigation, including the use of HDD ▪ Avoids direct impacts on the Muddy Creek/North Piney Creek-Green River or La Barge Creek/Birch Creek-Green River aquatic conservation areas. ▪ No high or moderate residual impacts would be anticipated **Special Status Species** ▪ Located within a watershed regulated for downstream depletions to the Colorado River to protect federally listed fish species and critical habitat; as proposed: • No water would be removed from the Colorado River system • Any hydrostatic testing water used from permitted contributing sources would be returned to the system in accordance with CWA discharge standards. ▪ No impacts on federally listed fish species and critical habitat from implementation of the Project would be anticipated.	**Aquatic Resources** ▪ Avoids direct impacts on the Muddy Creek/North Piney Creek-Green River or La Barge Creek/Birch Creek-Green River aquatic conservation areas. ▪ No high or moderate residual impacts would be anticipated **Special Status Species** ▪ Same as Alternative 2A: Proposed Action
Geology and topography – refer to Section 4.3.4 and MV-2, MV-3, and MV--4	**Geology and Topography (including Geohazards)** ▪ Crosses 9.1 miles of areas with moderate potential for flooding ▪ Crosses 0.6 mile of area with moderate susceptibility to landslides ▪ No Class B faults are crossed by this route. ▪ Construction activities in those areas with identified geological hazards could result in impacts on the Project or could activate landslide areas; however, the Project design and engineering, including design features of the Proposed Action for environmental protection, and agency-required mitigation measures, including micro-siting to avoid sensitive areas to extent practicable and minimizing construction on greater slopes would avoid, minimize, or reduce residual effects ▪ No high or moderate residual impacts would be anticipated. **Mineral Resources** ▪ Would result in 64.8 moderate residual impacts where the alternative route crosses mineral leases. ▪ The Applicant must acquire all access permissions for lands outside of their jurisdiction. The BLM expects that the Applicant would resolve any conflicts regarding mineral ownership and access along the selected route, including any compensation for economic impacts on leaseholders etc., through fee mineral and landowner and agreements and permissions ▪ No high residual impacts would be anticipated.	**Geology and Topography (including Geohazards)** ▪ Crosses 6.1 more miles of areas with high susceptibility to flooding than Alternative 2A: Proposed Action ▪ Crosses 5.2 more miles of areas with moderate susceptibility to flooding than Alternative 2A: Proposed Action ▪ No Class B faults are crossed by this route. ▪ Construction activities in those areas with identified geological hazards could result in impacts on the Project or could activate landslide areas; however, the Project design and engineering, including design features of the Proposed Action for environmental protection, and agency-required mitigation measures, including micro-siting to avoid sensitive areas to extent practicable and minimizing construction on greater slopes would avoid, minimize, or reduce residual effects ▪ No high or moderate residual impacts would be anticipated. **Mineral Resources** ▪ Would result in 72.9 miles of moderate residual impacts where the alternative route crosses mineral leases. ▪ The Applicant must acquire all access permissions for lands outside of their jurisdiction. The BLM expects that the Applicant would resolve any conflicts regarding mineral ownership and access along the selected route, including any compensation for economic impacts on leaseholders etc., through fee mineral and landowner and agreements and permissions ▪ No high residual impacts would be anticipated
Lands and realty – refer to Section 4.3.5 and MV-5	**Land Jurisdiction and Utility Corridors** ▪ 0.5 mile of moderate residual impacts where the alternative route crosses developed land-use type. **No high or moderate residual impacts would be anticipated Authorized Projects** ▪ No high or moderate residual impacts would be anticipated.	**Land Jurisdiction and Utility Corridors** ▪ Similar to 2A: Proposed Action **Authorized Projects** ▪ No high or moderate residual impacts would be anticipated. ▪ Crosses the least amount miles of authorized projects

Table 2-18
Alternative Route Comparison of Resources for Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Resources Analyzed	2A: Proposed Action (129.1 miles)	2B: Southern Route (136.2 miles)
	▪ Crosses the greatest amount miles of authorized projects (level of effects primarily related to alternative route length) **Future Land Use** ▪ No high or moderate residual impacts. ▪ Crosses the greatest amount of future land uses among routes considered in the segment	**Future Land Use** ▪ No high or moderate residual impacts. ▪ Crosses the least amount of future land uses among routes considered in the segment.
Livestock grazing – refer to Section 4.3.6	▪ Crosses 129.1 miles of grazing allotments. ▪ The types of impacts on livestock grazing operations and grazing allotments include temporary and permanent reduction of forage availability in grazing allotments, temporary altering of grazing patterns and locations, temporary reduction in forage species used for livestock grazing, and potential spread of noxious and invasive weeds from construction and maintenance activities. ▪ No high or moderate residual impacts would be anticipated.	▪ Crosses 136.2 miles of grazing allotments. ▪ The types of impacts on livestock grazing operations and grazing allotments include temporary and permanent reduction of forage availability in grazing allotments, temporary altering of grazing patterns and locations, temporary reduction in forage species used for livestock grazing, and potential spread of noxious and invasive weeds from construction and maintenance activities. ▪ No high or moderate residual impacts would be anticipated.
National Trails System – refer to Section 4.3.7 and MV-6	▪ 12.0 miles of moderate residual impacts where the alternative route crosses the Oregon/California/Mormon Pioneer/Pony Express NHTs, the Sublette Cutoff of the California NHT, and the Continental Divide National Scenic Trail (CDNST). Note the miles of impacts described in Chapter 4 are separated by trail and include areas where impacts on different trails overlap. ▪ No high residual impacts would be anticipated.	▪ 10.1 miles of moderate residual impacts where the alternative route crosses the Oregon/California/Mormon Pioneer/Pony Express NHTs, the Sublette Cutoff of the California NHT, and the CDNST. Note the miles of impacts described in Chapter 4 are separated by trail and include areas where impacts on different trails overlap. ▪ No high residual impacts would be anticipated.
Native American concerns – refer to Section 4.3.8	▪ 3 known sites of potential tribal importance would potentially be subject to indirect impacts (Percentage of cultural resources survey coverage: 6). ▪ There are no known sites of potential tribal importance in the direct effects APE (Percentage of cultural resources survey coverage: 23). ▪ Known and projected sites of potential tribal importance: 48 estimated sites. ▪ A key resource of potential tribal importance is the Arapahoe and Lost Creek Site (48SW4882). ▪ Avoids the Boars Tusk area. ▪ The tribes expressed concern about potential effects on natural resources (e.g., wildlife and their habitats, ethnobotanical resources, water) and plant-gathering locations and hunting areas. ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.	▪ 6 known sites of potential tribal importance would potentially be subject to direct and/or indirect impacts (Percentage of cultural resources survey coverage: 8). ▪ Known sites of potential tribal importance in the direct effects APE: 1 site (Percentage of cultural resources survey coverage: 17). ▪ Known and projected sites of potential tribal importance: 79 estimated sites. ▪ Known and projected sites of potential tribal importance in the direct effects APE: 1 estimated site. ▪ The Boars Tusk is located approximately 128 meters (indirect effects APE) north of this alternative route. Several tribes have concerns about portions of the Alternative Route 2B: Southern Route because of its proximity to this significant landmark and sacred landscape. ▪ Key resources of potential tribal importance are the Arapahoe and Lost Creek Site (48SW4882), the West Sand Dunes Archaeological District, and the Greater Sand Dunes ACEC). ▪ White Mountain Petroglyphs ACEC is located 4 miles to the south of this alternative route. ▪ The tribes expressed concern about potential effects on natural resources (e.g., wildlife and their habitats, ethnobotanical resources, water) and plant-gathering locations and hunting areas. ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.
Noise – refer to Section 4.3.9	▪ Noise associated with pipeline construction (without HDD) would be clearly audible within 1.8 miles of the equipment when not masked by other manmade or natural noise sources. ▪ Construction and HDD noise would be temporary and short term, and no residual noise effects would be anticipated for human or wildlife receptors due to distance to receptor and seasonal restrictions). ▪ Opportunities for solitude would be diminished temporarily at the WSAs and campground during construction, but sound levels would return to ambient conditions once the construction is completed.	▪ Same as Alternative 2A: Proposed Action
Lands with wilderness characteristics – refer to Section 4.3.10 and MV-7	▪ Would result in the removal of 131.7 acres from WY040-2011-059 but would not affect the long-term management of the remaining acreage of the unit. ▪ This unit has not yet been through the land-use planning process.	▪ No lands with wilderness characteristics are crossed by this route.
Paleontological resources – refer to Section 4.3.11 and MV-8	▪ Crosses 89 miles of geological units with PFYC 5; as part of the design features of the Proposed Action for environmental protection, paleontological monitors would be present during construction activities in areas having PFYC of 3 to 5 ▪ Crosses 4.3 miles of geological units with PFYC 4, and 16.7 miles of geological units with PFYC 3 ▪ No high or moderate residual impacts would be anticipated.	▪ Crosses 73.7 miles of geological units with PFYC 5: Proposed Action; as part of the design features of the Proposed Action for environmental protection, paleontological monitors would be present during construction activities in areas having PFYC of 3 to 5 ▪ Crosses 4.3 miles of geological units with PFYC 4, and 22.2 miles of geological units with PFYC 3. ▪ No high or moderate residual impacts would be anticipated.
Public health and safety – refer to Section 4.3.12	▪ No high or moderate residual impacts would be anticipated. Impacts from the proposed pipeline would be the same across all alternative routes.	▪ Same as 1A: Proposed Action
Recreation – refer to Section 4.3.13 and MV-5	**Recreation Trail** ▪ Crosses the CDNST once **Recreation Areas** Crosses 29 miles of ERMAs and 6.1 miles of SRMAs including: ▪ Lander Field Office ERMA (below-ground facilities only in Frontier Right-of-Way corridor) ▪ Green Mountain ERMA (below-ground facilities only in Frontier Right-of-Way corridor) ▪ CDNST ERMA (below-ground disturbance only in Frontier Right-of-Way corridor) ▪ Western ERMA (above-ground facilities permitted with mitigation) ▪ Oregon Mormon Pioneer California SRMA (crossings are permitted with stipulations) ▪ CDNST SRMA (below-ground utilities only in Frontier Right-of-Way corridor)	**Recreation Trail** Crosses the CDNST once **Recreation Areas** Crosses 29 miles of ERMAs and 6.1 miles of SRMAs including: ▪ Lander Field Office ERMA (below-ground facilities only in Frontier Right-of-Way corridor) ▪ Green Mountain ERMA (below-ground facilities only in Frontier Right-of-Way corridor) ▪ CDNST ERMA (below-ground disturbance only in Frontier Right-of-Way corridor) ▪ Western ERMA (above-ground facilities permitted with mitigation) ▪ Oregon Mormon Pioneer California SRMA (crossings are permitted with stipulations) ▪ CDNST SRMA (below-ground facilities only in Frontier Right-of-Way corridor)

Table 2-18
Alternative Route Comparison of Resources for Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Resources Analyzed	2A: Proposed Action (129.1 miles)	2B: Southern Route (136.2 miles)
Social and economic conditions – refer to Section 4.3.14	**Employment Effects** ▪ 201 direct and indirect short-term jobs during construction; 8 direct and indirect long-term jobs during operations **Property Values** ▪ No adverse effects **Property Tax Revenues** ▪ Estimated $48 million in local property tax revenues over 50-year life of Project **Environmental Justice** ▪ No disparate impacts on environmental justice populations would occur.	**Employment Effects** ▪ Same as Proposed Action **Property Values** ▪ Same as Proposed Action **Property Tax Revenues** ▪ Estimated $53 million in local property tax revenues over 50-year life of Project **Environmental Justice** ▪ Same as Proposed Action
Soils and reclamation – refer to Section 4.3.15 and MV-9	▪ Would result in 130 acres of temporary disturbance and 9 acres of permanent disturbance; Alternative 2A: Proposed Action the shortest route considered in this segment, which is preferable in terms of reclamation success. ▪ Cross 0.5 mile of soils with high susceptibility and 10.8 miles of soils with moderate susceptibility to water erosion ▪ Crosses 5.6 miles of soils with high susceptibility and 35.8 miles of soils with moderate susceptibility to wind erosion ▪ Crosses 9.0 miles of soils with higher compaction potential ▪ Crosses mores soils with low or moderate reclamation potential (12 more miles) than Alternative 2B: Southern Route that would require more mitigation to avoid soil loss and to achieve reclamation success ▪ With appropriate level of mitigation, no high or moderate residual impacts would be anticipated.	▪ Would result in 129 acres of temporary disturbance and 8 acres of permanent disturbance ▪ Crosses zero soils with high susceptibility and 2.8 more miles of soils with moderate susceptibility to water erosion than Alternative 2A: Proposed Action ▪ Crosses 2.2 fewer miles of soils with high susceptibility and 20.8 fewer miles of soils with moderate susceptibility to wind erosion than Alternative 2A: Proposed Action ▪ Crosses 0.1 fewer miles of soils with higher compaction potential than Alternative 2A: Proposed Action ▪ Crosses fewer soils with low or moderate reclamation potential than Alternative 2B: Southern Route ▪ With appropriate level of mitigation, no high or moderate residual impacts would be anticipated.
Special designations – refer to Section 4.3.16 and MV-7	▪ Crosses the Red Desert Watershed and Steamboat Mountain Management Area ▪ Avoids the Boars Tusk management area, a right-of-way avoidance area with surface-disturbing activities prohibited in the area unless such activity would enhance management of the geologic features	▪ Crosses the Red Desert Watershed for approximately 6 fewer miles than Alternative 2A: Proposed Action ▪ Crosses the West Sand Dunes Archaeological District and Boars Tusk management area
Transportation – refer to Section 4.3.17 and MV-5	▪ No high or moderate residual impacts would be anticipated. ▪ Impacts from the proposed pipeline would be the same across all alternative routes.	▪ Same as 1A: Proposed Action
Vegetation – refer to Section 4.3.18 and MV-10	**Vegetation** ▪ 1.2 miles of moderate residual impacts on vegetation resources as a result of ground disturbances on vegetation communities due to vegetation clearing and the potential for introduction of invasive and noxious weeds. ▪ No high residual impacts would be anticipated. **Special Status Plants** ▪ Crosses 82.5 miles of areas influencing Ute ladies'-tresses ▪ Residual effects would not be anticipated where the Project would cross these areas.	**Vegetation** ▪ 2.3 miles of moderate residual impacts on vegetation resources as a result of ground disturbances on vegetation communities due to vegetation clearing and the potential for introduction of invasive and noxious weeds ▪ No high residual impacts would be anticipated **Special Status Plants** ▪ Crosses 105.2 miles of areas influencing Ute ladies'-tresses ▪ Residual effects would not be anticipated where the Project would cross these areas.
Visual resources – refer to Section 4.3.19 and MV-11	**Scenery** ▪ 67.0 miles of moderate residual impacts in Class B and C landscapes. No high residual impacts. **Views** ▪ 44.5 miles of moderate residual in proximity to the Red Desert Backcountry Byway and U.S. Highway 191. No high residual impacts. ▪ Views between 0.0 to 0.5 mile away: 42.5 miles ▪ Views between 0.5 to 1.0 mile away: 2.2 miles **Compliance** ▪ Compliant with BLM VRM Class II, III, and IV objectives	**Scenery** ▪ 48.4 miles of moderate residual impacts in Class B and C landscapes. No high residual impacts. **Views** ▪ 5.1 miles of moderate residual impacts in proximity to the Boars Tusk and U.S. Highway 191. No high residual impacts. ▪ Views between 0.0 to 0.5 mile away -3.1 miles ▪ Views between 0.5 to 1.0 mile away: 3.0 miles **Compliance** ▪ Compliant with BLM VRM Class II, III, and IV objectives
Water resources – refer to Section 4.3.20 and MV-12	**Surface Water** ▪ Crosses 129.1 miles of surface water resources, including 21.4 miles of intermittent streams and 4.5 mile of perennial streams. ▪ Low impacts on 25.6 miles (intermittent and perennial streams) would be anticipated after application of agency-required mitigation micro-siting to avoid the streams to the extent possible and minimizing disturbance within 500 feet (153 meters) of streams ▪ No waters crossed that are listed on the CWA 303(d) list of impaired waters by the WDEQ **Groundwater** ▪ Crosses 20 springs ▪ No designated drinking water supplies, sole aquifers, wellhead protection zones, or other public drinking water supply resources ▪ Agency-required mitigation measures applied to pipeline would include micro-siting to avoid springs or minimization of disturbance and intense reclamation to avoid construction-caused hydrologic alterations or disruptions ▪ Operational emergency responses would be conducted in accordance with USDOT PHMSA requirements. ▪ No high or moderate residual impacts would be anticipated.	**Surface Water** ▪ Crosses 0.9 more miles of intermittent waters than Alternative 2A: Proposed Action and the 0.6 fewer miles of perennial water resources ▪ Only low impacts on 7.0 miles (intermittent and perennial streams) would be anticipated after application of agency-required mitigation micro-siting to avoid the streams to the extent possible and minimizing disturbance within 500 feet (153 meters) of streams ▪ Crosses 1.8 miles of waters listed on the CWA 303(d) list of impaired waters by the WDEQ. **Groundwater** ▪ Crosses 10 springs ▪ No designated drinking water supplies, sole aquifers, wellhead protection zones, or other public drinking water supply resources ▪ Agency-required mitigation measures applied to pipeline would include micro-siting to avoid springs or minimization of disturbance and intense reclamation to avoid construction-caused hydrologic alterations or disruptions ▪ Operational emergency responses would be conducted in accordance with USDOT PHMSA requirements. ▪ No high or moderate residual impacts would be anticipated.

Table 2-18
Alternative Route Comparison of Resources for Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Resources Analyzed	2A: Proposed Action (129.1 miles)	2B: Southern Route (136.2 miles)
Wetlands – refer to Section 4.3.21	**Wetlands** ▪ Crosses 0.2 mile of palustrine emergent and 0.6 mile of palustrine forested/shrub wetlands ▪ Would result in temporary disturbance of approximately 3 acres for palustrine emergent and 3 acres of palustrine forested/shrub wetlands and more than 1 acre of permanent disturbance each to palustrine emergent and palustrine forested/shrub wetlands **Riparian Areas** ▪ Route crosses 0.6 mile of riparian areas ▪ Without mitigation, would result in temporary disturbance of approximately 9 acres and 4 acres of permanent disturbance to riparian areas ▪ Agency-required mitigation measures applied to pipeline would include avoiding riparian areas at the Big Sandy River by HDD, minimizing disturbance within 500 feet (153 meters) of streams, and minimizing the removal of trees in riparian areas ▪ No high or moderate residual impacts would be anticipated	**Wetlands** ▪ Crosses 0.4 more miles of palustrine emergent and 0.2 less miles of palustrine forested/shrub wetlands than Alternative 2A: Proposed Action ▪ Would result in temporary disturbance of 6 more acres for palustrine emergent and 3 less acres of palustrine forested/shrub wetlands and 3 more acres and 1 less acres of permanent disturbance, respectively, than Alternative 2A: Proposed Action **Riparian Areas** ▪ Route crosses 0.2 fewer miles of riparian areas than Alternative 2A: Proposed Action ▪ Without mitigation, would result less temporary and permanent disturbance to riparian areas ▪ Agency-required mitigation measures applied to pipeline would include avoiding riparian areas at the Big Sandy River by HDD, minimizing disturbance within 500 feet (153 meters) of streams, and minimizing the removal of trees in riparian areas ▪ No high or moderate residual impacts would be anticipated.
Wild horses and burros – refer to Section 4.3.22 and MV-7	▪ Crosses 68.3 miles of HMA ▪ No high or moderate residual impacts would be anticipated.	▪ Crosses 88.1 miles of HMA ▪ No high or moderate residual impacts would be anticipated.
Wildlife – refer to Section 4.3.23 and MV-13 through MV-15	**Big Game** ▪ Would result in low impacts on 48.3 miles of big game range, migration corridors, and parturition areas, including the Red Desert to Hoback mule deer migration corridor ▪ No high or moderate residual impacts would be anticipated. **Migratory Birds and Bald and Golden Eagles** ▪ Would result in low impacts on 129.1 miles of eagle habitat because seasonal restrictions would minimize moderate or high impacts on bald and golden eagles. ▪ Preconstruction surveys would identify the most recent nest activity status, new nests, and any additional mitigation modifications needed to minimize impacts. ▪ Route crosses suitable migratory bird habitat, in particular for sagebrush bird assemblages; however, impacts on migratory birds would be anticipated to be low as construction would avoid the migratory bird nesting period; also, avoidance and intense reclamation of riparian habitats and wetlands, areas generally important to migratory birds, would be required, which would minimize effects on migratory birds ▪ No high or moderate residual impacts would be anticipated. **Special Status Wildlife** ▪ Located outside of potential yellow-billed cuckoo habitat ▪ Located outside USFWS-mapped AOI for Canada lynx **Greater Sage-Grouse** ▪ Crosses 129.1 miles of GHMA; 83.7 miles of PHMA; and 35.1 miles of SFAs ▪ Crosses within 0.6 mile of three occupied leks in PHMA and 0.25 mile of one occupied lek in GHMA ▪ Estimated Project disturbance to PHMA for Alternative 2A: Proposed Action is only slightly greater than the Alternative 2B: Southern Route but would result in substantially greater cumulative disturbance based on the DDCT process, as a result of greater existing disturbances in the PHMA assessment area; the cumulative disturbance in PHMA for Alternative 2A: Proposed Action would be 4.58 percent, exceeding the 5 percent of the DDCT area allowable under the Wyoming ARMPA.	**Big Game** ▪ Would result in low impacts on 57.4 miles of big game range, migration corridors, and parturition areas, including the Red Desert to Hoback mule deer migration corridor ▪ No high or moderate residual impacts would be anticipated. **Migratory Birds and Bald and Golden Eagles** ▪ Would result in low impacts on 136.1 miles of eagle habitat because seasonal restrictions would minimize moderate or high impacts on bald and golden eagles. ▪ Preconstruction surveys would identify the most recent nest activity status, new nests, and any additional mitigation modifications needed to minimize impacts. ▪ Route crosses suitable migratory bird habitat, in particular for sagebrush bird assemblages; however, impacts on migratory birds would be anticipated to be low as construction would avoid the migratory bird nesting period; also, avoidance and intense reclamation of riparian habitats and wetlands, areas generally important to migratory birds, would be required, which would minimize effects on migratory birds ▪ No high or moderate residual impacts would be anticipated. **Special Status Wildlife** ▪ Same as Alternative 2A: Proposed Action **Greater Sage-Grouse** ▪ Crosses 136.2 miles of GHMA; 78.1 miles of PHMA; and 38.3 miles of SFAs ▪ The estimated cumulative disturbance in PHMA for Alternative 2B: Southern Route is 2.4 percent, which would be under the 5 percent of the DDCT area allowable under the Wyoming ARMPA.

NOTES:
[1]For brevity (Cultural Section), the overlapping segments of the Oregon, California, Mormon Pioneer, and Pony Express NHTs are collectively referred herein to as the "Emigrant NHTs."
[2]The West Sand Dunes Archaeological District is not a National Register District or Designation; this area is only identified as a District in the BLM Green River Field Office RMP.

Table 2-19
Alternative Route Comparison of Resources for Segment 3: Bairoil Interconnect to the Lost Basin/Natrona Hub Interconnect

Resources Analyzed	3A: Proposed Action (83.2 miles)	3B: Lost Creek to Lost Cabin (73.0 miles)	3C: Lost Creek to Highway 20/26 (101.4 miles)
Air quality (including GHGs and climate change) – refer to Section 4.3.1	▪ No high or moderate residual impacts would be anticipated. ▪ Among all alternative routes, the nature of the Proposed Action impacts would be the similar and proportionate to the alternative route length and construction schedule.	▪ Similar to 1A: Proposed Action ▪ Because it is the shortest route, impacts would be the least for 2A: Proposed Action	▪ Similar to 1A: Proposed Action ▪ Because it is the longest route, impacts would be greater than Alternative 3A: Proposed Action but not by a significant extent or magnitude
Cultural resources – refer to Section 4.3.2	▪ 230 known sites, including 47 historic properties, would potentially be subject to direct and/or indirect impacts (Percentage of cultural resources survey coverage: 19). ▪ Known sites in the direct effects APE: 64, including 12 historic properties (Percentage of cultural resources survey coverage: 27). ▪ Known site density: 2.24 sites per 100 acres. ▪ Known and projected sites: 1,202 estimated sites, including 246 historic properties. ▪ Known and projected sites in the direct effects APE: 97 estimated sites, including 18 historic properties. ▪ Key resources include the Emigrant NHTs[1], the Bridger Trail, the Rawlins to Fort Washakie Road, Home on the Range Stage Station, Crooks Gap Stage Station, and several NHT-related sites (e.g., Three Crossings Stage Station and multiple crossings of the Sweetwater River); the stage stations and contributing segments of the trails are in the direct effects APE. ▪ Potential to directly affect unrecorded, significant sites that may exist in the Crooks Gap-Sheep Mountain area. ▪ Several sites associated with a resource of Native American concern (Cedar Ridge TCP) are in proximity to this alternative route. ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.	▪ 268 known sites, including 50 historic properties, would potentially be subject to direct and/or indirect impacts (Percentage of cultural resources survey coverage: 27). ▪ Known sites in the direct effects APE: 106, including 21 historic properties (Percentage of cultural resources survey coverage: 36). ▪ Known site density: 2.12 sites per 100 acres. ▪ Known and projected sites: 999 estimated sites, including 186 historic properties. ▪ Known and projected sites in the direct effects APE: 130 estimated sites, including 26 historic properties. ▪ Same key resources as Alternative 3A: Proposed Action ▪ Potential to directly affect unrecorded, significant sites that may exist in the Crooks Gap-Sheep Mountain area. ▪ A resource of Native American concern (Cedar Ridge TCP) is in the vicinity of this alternative route. This resource is located approximately 5 miles to the northeast of the centerline for this alternative route. ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.	▪ 357 known sites, including 67 historic properties, would potentially be subject to direct and/or indirect impacts (Percentage of cultural resources survey coverage: 24). ▪ Known sites in the direct effects APE: 101, including 23 historic properties (Percentage of cultural resources survey coverage: 42). ▪ Known site density: 2.29 sites per 100 acres. ▪ Known and projected number of sites: 1,491 estimated sites, including 280 historic properties. ▪ Known and projected sites in the direct effects APE: 133 estimated sites, including 30 historic properties. ▪ Same key resources as Alternative 3A: Proposed Action, except for two additional sites (NRHP-listed Waltman Crossing [48NA561] and Powder River Train Station [48NA808]); this alternative route crosses the same sites as those identified for Alternative 3A: Proposed Action, except for the Bridger Trail. ▪ The Cedar Ridge TCP is located approximately 9 miles to the north of the centerline for this alternative route. ▪ Potential to directly affect unrecorded, significant sites that may exist in the Crooks Gap–Sheep Mountain area. ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.
Fish and aquatics – refer to Section 4.3.3	**Aquatic Resources** ▪ No crucial streams, red or blue ribbon trout streams, or aquatic conservation areas are crossed or in the downstream receiving watersheds of the route **Special Status Species** ▪ Located within a watershed regulated for downstream depletions to the Platte River to protect federally listed fish species and critical habitat; as proposed: • No water would be removed from the Platte River system • Any hydrostatic testing water used from permitted contributing sources would be returned to the system in accordance with CWA discharge standards. ▪ No impacts on federally listed fish species and critical habitat from implementation of the Project would be anticipated.	**Aquatic Resources** ▪ Same as Alternative 3A: Proposed Action **Special Status Species** ▪ Same as Alternative 3A: Proposed Action	**Aquatic Resources** ▪ Same as Alternative 3A: Proposed Action **Special Status Species** ▪ Same as Alternative 3A: Proposed Action
Geology and topography – refer to Section 4.3.4 and MV-2, MV-3, and MV-4	**Geology and Topography (including Geohazards)** ▪ Crosses 8.6 miles of areas with moderate potential for flooding ▪ Crosses 0.2 mile of area with high susceptibility to landslides ▪ Crosses 3.2 mile of area with moderate susceptibility to landslides ▪ Crosses 0.3 mile of Class B faults ▪ Construction activities in those areas with identified geological hazards could result in impacts on the Project or could activate landslide areas; however, the Project design and engineering, including design features of the Proposed Action for environmental protection, and agency-required mitigation measures, including micro-siting to avoid sensitive areas to extent practicable and minimizing construction on greater slopes would avoid, minimize, or reduce residual effects ▪ No high or moderate residual impacts would be anticipated. **Mineral Resources** ▪ Would result in 43.2 moderate residual impacts where the alternative route crosses mineral leases. ▪ The Applicant must acquire all access permissions for lands outside of their jurisdiction. The BLM expects that the Applicant would resolve any conflicts regarding mineral ownership and access along the selected route, including	**Geology and Topography (including Geohazards)** ▪ Crosses 0.6 mile of areas with high susceptibility to flooding compared to zero miles by Alternative 3A: Proposed Action ▪ Crosses 2.1 more miles of areas with moderate susceptibility to flooding than Alternative 3A: Proposed Action ▪ Crosses 0.2 fewer miles of area with high susceptibility to landslides than Alternative 3A: Proposed Action ▪ Crosses 2.4 fewer miles of area with moderate susceptibility to landslides than Alternative 3A: Proposed Action ▪ Crosses 0.3 mile of Class B faults (same as Alternative 3A: Proposed Action) ▪ Construction activities in those areas with identified geological hazards could result in impacts on the Project or could activate landslide areas; however, the Project design and engineering, including design features of the Proposed Action for environmental protection, and agency-required mitigation measures, including micro-siting to avoid sensitive areas to extent practicable and minimizing construction on greater slopes would avoid, minimize, or reduce residual effects ▪ No high or moderate residual impacts would be anticipated.	**Geology and Topography (including Geohazards)** ▪ Crosses 0.6 mile of areas with high susceptibility to flooding compared to zero miles by Alternative 3A: Proposed Action ▪ Crosses 11.7 more miles of areas with moderate susceptibility to flooding than Alternative 3A: Proposed Action ▪ Crosses 0.2 fewer miles of area with high susceptibility to landslides than Alternative 3A: Proposed Action ▪ Crosses 2.4 fewer miles of area with moderate susceptibility to landslides than Alternative 3A: Proposed Action ▪ Crosses 0.3 mile of Class B faults (same as Alternative 3A: Proposed Action) ▪ Construction activities in those areas with identified geological hazards could result in impacts on the Project or could activate landslide areas; however, the Project design and engineering, including design features of the Proposed Action for environmental protection, and agency-required mitigation measures, including micro-siting to avoid sensitive areas to extent practicable and minimizing construction on greater slopes would avoid, minimize, or reduce residual effects ▪ No high or moderate residual impacts would be anticipated.

Table 2-19
Alternative Route Comparison of Resources for Segment 3: Bairoil Interconnect to the Lost Basin/Natrona Hub Interconnect

Resources Analyzed	3A: Proposed Action (83.2 miles)	3B: Lost Creek to Lost Cabin (73.0 miles)	3C: Lost Creek to Highway 20/26 (101.4 miles)
	any compensation for economic impacts on leaseholders etc., through fee mineral and landowner and agreements and permissions ▪ No high residual impacts would be anticipated.	**Mineral Resources** ▪ Would result in 60.7 miles of moderate residual impacts where the alternative route crosses mineral leases. ▪ The Applicant must acquire all access permissions for lands outside of their jurisdiction. The BLM expects that the Applicant would resolve any conflicts regarding mineral ownership and access along the selected route, including any compensation for economic impacts on leaseholders etc., through fee mineral and landowner and agreements and permissions ▪ No high residual impacts would be anticipated	**Mineral Resources** ▪ Would result in 69.3 miles of moderate residual impacts where the alternative route crosses mineral leases. No high residual impacts.
Lands and realty – refer to Section 4.3.5 and MV-5	**Land Jurisdiction and Utility Corridors** ▪ 0.5 mile of moderate residual impacts where the alternative route crosses developed land-use type. **No high or moderate residual impacts would be anticipated Authorized Projects** ▪ No high or moderate residual impacts would be anticipated ▪ Crosses the least number of authorized projects among routes considered in the segment (level of effects primarily related to alternative route length) **Future Land Use** ▪ No high or moderate residual impacts. ▪ Crosses the least amount of future land uses among routes considered in the segment (level of effects primarily related to alternative route length)	**Land Jurisdiction and Utility Corridors** ▪ Similar to 3A: Proposed Action **Authorized Projects** ▪ No high or moderate residual impacts would be anticipated. **Future Land Use** ▪ No high or moderate residual impacts	**Land Jurisdiction and Utility Corridors** ▪ Similar to 3A: Proposed Action **Authorized Projects** ▪ No high or moderate residual impacts would be anticipated. ▪ Crosses the greatest amount miles of authorized projects (level of effects primarily related to alternative route length) **Future Land Use** ▪ No high or moderate residual impacts ▪ Crosses the greatest amount of future land uses among routes considered in the segment (level of effects primarily related to alternative route length)
Livestock grazing – refer to Section 4.3.6	▪ Crosses 81.5 miles of grazing allotments. ▪ The types of impacts on livestock grazing operations and grazing allotments include temporary and permanent reduction of forage availability in grazing allotments, temporary altering of grazing patterns and locations, temporary reduction in forage species used for livestock grazing, and potential spread of noxious and invasive weeds from construction and maintenance activities. ▪ No high or moderate residual impacts would be anticipated.	▪ Crosses 72.9 miles of grazing allotments. ▪ The types of impacts on livestock grazing operations and grazing allotments include temporary and permanent reduction of forage availability in grazing allotments, temporary altering of grazing patterns and locations, temporary reduction in forage species used for livestock grazing, and potential spread of noxious and invasive weeds from construction and maintenance activities. ▪ No high or moderate residual impacts would be anticipated.	▪ Crosses 71.8 miles of grazing allotments. ▪ The types of impacts on livestock grazing operations and grazing allotments include temporary and permanent reduction of forage availability in grazing allotments, temporary altering of grazing patterns and locations, temporary reduction in forage species used for livestock grazing, and potential spread of noxious and invasive weeds from construction and maintenance activities. ▪ No high or moderate residual impacts would be anticipated.
National Trails System – refer to Section 4.3.7 and MV-6	▪ 2.7 miles of moderate residual impacts where the alternative route crosses the Oregon/California/Mormon Pioneer/Pony Express NHTs. ▪ No high residual impacts would be anticipated.	▪ 2.7 miles of moderate residual impacts where the alternative route crosses the Oregon/California/Mormon Pioneer/Pony Express NHTs. ▪ No high residual impacts would be anticipated.	▪ 2.7 miles of moderate residual impacts where the alternative route crosses the Oregon/California/Mormon Pioneer/Pony Express NHTs. ▪ No high residual impacts would be anticipated.
Native American concerns – refer to Section 4.3.8	▪ 26 known sites of potential tribal importance would potentially be subject to direct and/or indirect impacts (Percentage of coverage [Intensive: 19). ▪ Known sites of potential tribal importance in the direct effects APE: 4 sites (Percentage of cultural resources survey coverage: 27). ▪ Known and projected sites of potential tribal importance: 136 estimated sites. ▪ Known and projected sites of potential tribal importance in the direct effects APE: 6 estimated sites. ▪ The alternative route would impact sites associated to the Cedar Ridge TCP. The tribes object to this alternative route. ▪ The tribes expressed concern about potential effects on natural resources (e.g., wildlife and their habitats, ethnobotanical resources, water) and plant-gathering locations and hunting areas. ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.	▪ 24 known sites of potential tribal importance would potentially be subject to direct and/or indirect impacts (Percentage of cultural resources survey coverage: 27). ▪ Known sites of potential tribal importance in the direct effects APE: 3 sites (Percentage of cultural resources survey coverage: 36). ▪ Known and projected sites of potential tribal importance: 89 estimated sites. ▪ Known and projected sites of potential tribal importance in the direct effects APE: 4 estimated sites. ▪ While the Cedar Ridge TCP is located in the vicinity of this alternative route, locating the pipeline within the Lost Creek corridor would be acceptable to the tribes, with micro-siting in some locations to avoid sites. ▪ The tribes expressed concern about potential effects on natural resources (e.g., wildlife and their habitats, ethnobotanical resources, water) and plant-gathering locations and hunting areas. ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.	▪ 16 known sites of potential tribal importance would potentially be subject to direct and/or indirect impacts (Percentage of cultural resources survey coverage: 24). ▪ Known sites of potential tribal importance in the direct effects APE: 2 sites (Percentage of cultural resources survey coverage: 42). ▪ Known and projected sites of potential tribal importance: 67 estimated sites. ▪ Known and projected sites of potential tribal importance in the direct effects APE: 3 estimated sites. ▪ The tribes expressed concern about portions of this alternative route due to the presence of known sites of tribal importance. ▪ The tribes expressed concern about potential effects on natural resources (e.g., wildlife and their habitats, ethnobotanical resources, water) and plant-gathering locations and hunting areas. ▪ Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

Table 2-19
Alternative Route Comparison of Resources for Segment 3: Bairoil Interconnect to the Lost Basin/Natrona Hub Interconnect

Resources Analyzed	3A: Proposed Action (83.2 miles)	3B: Lost Creek to Lost Cabin (73.0 miles)	3C: Lost Creek to Highway 20/26 (101.4 miles)
Noise – refer to Section 4.3.9	▪ Noise associated with pipeline construction (without HDD) would be clearly audible within 1.8 miles of the equipment when not masked by other manmade or natural noise sources. ▪ Construction and HDD noise would be temporary and short term, and no residual noise effects would be anticipated for human or wildlife receptors due to distance to receptor and seasonal restrictions). ▪ Opportunities for solitude would be diminished temporarily at the WSAs and campground during construction, but sound levels would return to ambient conditions once the construction is completed.	▪ Same as Alternative 3A: Proposed Action	▪ Same as Alternative 3A: Proposed Action
Lands with wilderness characteristics – refer to Section 4.3.10 and MV-7	▪ No lands with wilderness characteristics are crossed by this route.	▪ No lands with wilderness characteristics are crossed by this route.	▪ No lands with wilderness characteristics are crossed by this route.
Paleontological resources – refer to Section 4.3.11 and MV-8	▪ Crosses 31.6 miles of geological units with PFYC 5; as part of the design features of the Proposed Action for environmental protection, paleontological monitors would be present during construction activities in areas having PFYC of 3 to 5 ▪ Crosses 0.4 mile of geological units with PFYC 4, and 33.5 miles of geological units with PFYC 3. ▪ No high or moderate residual impacts would be anticipated.	▪ Crosses 26.8 miles of geological units with PFYC 5: Proposed Action; as part of the design features of the Proposed Action for environmental protection, paleontological monitors would be present during construction activities in areas having PFYC of 3 to 5 ▪ Does not cross geological units with PFYC 4, but does cross 19.8 miles of geological units with PFYC 3. ▪ No high or moderate residual impacts would be anticipated.	▪ Crosses 37.4 miles of geological units with PFYC 5: Proposed Action; as part of the design features of the Proposed Action for environmental protection, paleontological monitors would be present during construction activities in areas having PFYC of 3 to 5 ▪ Does not cross geological units with PFYC 4, but does cross 15.3 miles of geological units with PFYC 3. ▪ No high or moderate residual impacts would be anticipated.
Public health and safety – refer to Section 4.3.12	▪ No high or moderate residual impacts would be anticipated. Impacts from the proposed pipeline would be the same across all alternative routes.	▪ Same as 3A: Proposed Action	▪ Same as 3A: Proposed Action
Recreation – refer to Section 4.3.13 and MV-5	**Recreation Areas** ▪ Crosses 28.8 miles of ERMAs and 13.5 miles of SRMAs: ▪ Lander Field Office ERMA (Lost Creek right-of-way corridor does not permit above-ground facilities in portions of the corridor) ▪ Green Mountain ERMA (Bairoil right-of-way corridor permits below-ground utilities only) ▪ CDNST SRMA (Bairoil right-of-way corridor permits below-ground utilities only) ▪ NHTs Destination SRMA	**Recreation Areas** ▪ Crosses 49.6 miles of ERMAs and 13.5 miles of SRMAs: ▪ Lander Field Office ERMA (Lost Creek right-of-way corridor does not permit above-ground facilities in portions of the corridor) ▪ Green Mountain ERMA (Bairoil right-of-way corridor permits below-ground utilities only) ▪ CDNST SRMA (Bairoil right-of-way corridor permits below-ground utilities only) ▪ NHTs Destination SRMA	**Recreation Areas** ▪ Crosses 44.3 miles of ERMAs and 13.5 miles of SRMAs: ▪ Lander Field Office ERMA (Lost Creek right-of-way corridor does not permit above-ground facilities in portions of the corridor) ▪ Green Mountain ERMA (Bairoil right-of-way corridor permits below-ground utilities only) ▪ CDNST SRMA (Bairoil right-of-way corridor permits below-ground utilities only) ▪ NHTs Destination SRMA
Social and economic conditions – refer to Section 4.3.14	**Employment Effects** ▪ 125 direct and indirect short-term jobs during construction; 7 direct and indirect long-term jobs during operations **Property Values** ▪ No adverse effects anticipated **Property Tax Revenues** ▪ Estimated $35 million in local property tax revenues over 50-year life of Project **Environmental Justice** ▪ No disparate impacts on environmental justice populations would occur.	**Employment Effects** ▪ Same as Alternative 3A: Proposed Action **Property Values** ▪ Same as Alternative 3A: Proposed Action **Property Tax Revenues** ▪ Estimated $32 million in local property tax revenues over 50-year life of Project **Environmental Justice** ▪ Same as Proposed Action	**Employment Effects** ▪ Same as Alternative 3A: Proposed Action **Property Values** ▪ Same as Alternative 3A: Proposed Action **Property Tax Revenues** ▪ Estimated $44 million in local property tax revenues over 50-year life of Project **Environmental Justice** ▪ Same as Proposed Action
Soils and reclamation – refer to Section 4.3.15 and MV-9	▪ Would result in 413 acres of temporary disturbance and 17 acres of permanent disturbance; Alternative 2A: Proposed Action the shortest route considered in this segment, which is preferable in terms of reclamation success. ▪ Cross 1.8 miles of soils with high susceptibility and 25.1 miles of soils with moderate susceptibility to water erosion ▪ Crosses 2.9 miles of soils with high susceptibility and 57.3 miles of soils with moderate susceptibility to wind erosion ▪ Crosses 26.9 miles of soils with higher compaction potential ▪ Crosses 21.8 miles of soils with low or moderate reclamation potential that would require more mitigation to avoid soil loss and to achieve reclamation success ▪ With appropriate level of mitigation, no high or moderate residual impacts would be anticipated.	▪ Would result in 83 less acres of temporary disturbance and 3 less acres of permanent disturbance than Alternative 3A: Proposed Action ▪ Crosses 1.3 more miles of soils with high susceptibility and 2 fewer miles of soils with moderate susceptibility to water erosion than Alternative 3A: Proposed Action ▪ Crosses 6.1 fewer miles of soils with high susceptibility and 8.1 fewer miles of soils with moderate susceptibility to wind erosion than Alternative 3A: Proposed Action ▪ Crosses 5.5 fewer miles of soils with higher compaction potential than Alternative 3A: Proposed Action ▪ Crosses 17.5 miles of soils with low or moderate reclamation potential ▪ With appropriate level of mitigation, no high or moderate residual impacts would be anticipated.	▪ Would result in 73 less acres of temporary disturbance and 3 less acres of permanent disturbance than Alternative 3A: Proposed Action ▪ Crosses 2.5 more miles of soils with high susceptibility and 3.3 fewer miles of soils with moderate susceptibility to water erosion than Alternative 3A: Proposed Action ▪ Crosses 9.7 more miles of soils with high susceptibility and 12.6 more miles of soils with moderate susceptibility to wind erosion than Alternative 3A: Proposed Action ▪ Crosses 5.5 fewer miles of soils with higher compaction potential than Alternative 3A: Proposed Action ▪ Crosses 27 miles of soils with low or moderate reclamation potential ▪ With appropriate level of mitigation, no high or moderate residual impacts would be anticipated.
Special designations – refer to Section 4.3.16 and MV-7	▪ Crosses 14.8 miles of areas managed for oil and gas development (18 percent of route)	▪ Crosses 25.8 miles of areas managed for oil and gas development (35 percent of route)	▪ Crosses 29.9 miles of areas managed for oil and gas development (30 percent of route)

Table 2-19
Alternative Route Comparison of Resources for Segment 3: Bairoil Interconnect to the Lost Basin/Natrona Hub Interconnect

Resources Analyzed	3A: Proposed Action (83.2 miles)	3B: Lost Creek to Lost Cabin (73.0 miles)	3C: Lost Creek to Highway 20/26 (101.4 miles)
Transportation – refer to Section 4.3.17 and MV-5	▪ No high or moderate residual impacts would be anticipated. ▪ Impacts from the proposed pipeline would be the same across all alternative routes.	▪ Same as Alternative 3A: Proposed Action	▪ Same as Alternative 3A: Proposed Action
Vegetation – refer to Section 4.3.18 and MV-10	**Vegetation** ▪ 0.8 mile of moderate residual impacts vegetation resources as a result of ground disturbances on vegetation communities due to vegetation clearing and the potential for introduction of invasive and noxious weeds. ▪ No high residual impacts would be anticipated. **Special Status Plants** ▪ Crosses 82.3 miles of areas influencing Ute ladies'-tresses and 0.6 mile of modeled Ute ladies'-tresses habitat in the floodplain of the Sweetwater River ▪ Mitigation measures to reduce effects through avoidance and control of noxious weeds would avoid or reduce residual impacts on Ute ladies'-tresses	**Vegetation** ▪ 0.5 mile of moderate residual impacts vegetation resources as a result of ground disturbances on vegetation communities due to vegetation clearing and the potential for introduction of invasive and noxious weeds. ▪ No high residual impacts would be anticipated. **Special Status Plants** ▪ Crosses 72.7 miles of areas influencing Ute ladies'-tresses and 0.6 mile of modeled Ute ladies'-tresses habitat in the floodplain of the Sweetwater River ▪ Mitigation measures to reduce effects through avoidance and control of noxious weeds would avoid or reduce residual impacts on Ute ladies'-tresses	**Vegetation** ▪ 0.4 mile of moderate residual impacts vegetation resources as a result of ground disturbances on vegetation communities due to vegetation clearing and the potential for introduction of invasive and noxious weeds. ▪ No high residual impacts would be anticipated. **Special Status Plants** ▪ Crosses 101.1 miles of areas influencing Ute ladies'-tresses and 0.6 mile of modeled Ute ladies'-tresses habitat in the floodplain of the Sweetwater River ▪ Mitigation measures to reduce effects through avoidance and control of noxious weeds would avoid or reduce residual impacts on Ute ladies'-tresses
Visual resources – refer to Section 4.3.19 and MV-11	**Scenery** ▪ 0.3 mile of moderate residual impacts in Class B landscapes. No high residual impacts. **Views** ▪ 1.7 miles of moderate residual impacts where the Project crosses U.S. Highway 287. No high residual impacts. ▪ Views between 0.0 to 0.5 mile away: 1.2 miles ▪ Views between 0.5 to 1.0 mile away: 2.4 miles **Compliance** ▪ Compliant with BLM VRM Class II, III, and IV objectives	**Scenery** ▪ 0.1 mile of moderate residual impacts in Class B landscapes. No high residual impacts. **Views** ▪ 2.0 miles of moderate residual impacts where the Project crosses U.S. Highway 287. No high residual impacts. ▪ Views between 0.0 to 0.5 mile away: 2.0 miles ▪ Views between 0.5 to 1.0 mile away: 3.0 miles **Compliance** ▪ Compliant with BLM VRM Class II, III, and IV objectives	**Scenery** ▪ 0.1 mile of moderate residual impacts in Class B landscapes. No high residual impacts. **Views** ▪ 41.7 miles of moderate residual where the Project parallels U.S. Highway 20 and crosses U.S. Highway 287. No high residual impacts. ▪ Views between 0.0 to 0.5 mile away: 41.8 miles ▪ Views between 0.5 to 1.0 mile away: 2.5 miles **Compliance** ▪ Compliant with BLM VRM Class II, III, and IV objectives
Water resources – refer to Section 4.3.20 and MV-12	**Surface Water** ▪ Crosses 83.2 miles of surface water resources, including 15.5 miles of intermittent streams and 1.9 miles of perennial streams. ▪ Low impacts on 18.3 miles (intermittent and perennial streams) would be anticipated after application of agency-required mitigation micro-siting to avoid the streams to the extent possible and minimizing disturbance within 500 feet (153 meters) of streams ▪ No waters crossed that are listed on the CWA 303(d) list of impaired waters by the WDEQ **Groundwater** ▪ Crosses 7 springs ▪ No designated drinking water supplies, sole aquifers, wellhead protection zones, or other public drinking water supply resources ▪ Agency-required mitigation measures applied to pipeline would include micro-siting to avoid springs or minimization of disturbance and intense reclamation to avoid construction-caused hydrologic alterations or disruptions ▪ Operational emergency responses would be conducted in accordance with USDOT PHMSA requirements. ▪ No high or moderate residual impacts would be anticipated.	**Surface Water** ▪ Crosses 0.3 fewer miles of intermittent waters than Alternative 3A: Proposed Action and the 3.2 fewer miles of perennial water resources ▪ Low impacts on 1.5 fewer miles (intermittent and perennial streams) would be anticipated after application of agency-required mitigation micro-siting to avoid the streams to the extent possible and minimizing disturbance within 500 feet (153 meters) of streams ▪ No waters crossed that are listed on the CWA 303(d) list of impaired waters by the WDEQ **Groundwater** ▪ Crosses one springs ▪ No designated drinking water supplies, sole aquifers, wellhead protection zones, or other public drinking water supply resources ▪ Agency-required mitigation measures applied to pipeline would include micro-siting to avoid springs or minimization of disturbance and intense reclamation to avoid construction-caused hydrologic alterations or disruptions ▪ Operational emergency responses would be conducted in accordance with USDOT PHMSA requirements. ▪ No high or moderate residual impacts would be anticipated.	**Surface Water** ▪ Crosses 0.6 more miles of intermittent waters than Alternative 3A: Proposed Action and the 1.5 fewer miles of perennial water resources ▪ Only low impacts on 1.5 miles (intermittent and perennial streams) would be anticipated after application of agency-required mitigation micro-siting to avoid the streams to the extent possible and minimizing disturbance within 500 feet (153 meters) of streams ▪ No waters crossed that are listed on the CWA 303(d) list of impaired waters by the WDEQ **Groundwater** ▪ Crosses four springs ▪ No designated drinking water supplies, sole aquifers, wellhead protection zones, or other public drinking water supply resources ▪ Agency-required mitigation measures applied to pipeline would include micro-siting to avoid springs or minimization of disturbance and intense reclamation to avoid construction-caused hydrologic alterations or disruptions ▪ Operational emergency responses would be conducted in accordance with USDOT PHMSA requirements. ▪ No high or moderate residual impacts would be anticipated.

Table 2-19
Alternative Route Comparison of Resources for Segment 3: Bairoil Interconnect to the Lost Basin/Natrona Hub Interconnect

Resources Analyzed	3A: Proposed Action (83.2 miles)	3B: Lost Creek to Lost Cabin (73.0 miles)	3C: Lost Creek to Highway 20/26 (101.4 miles)
Wetlands – refer to Section 4.3.21	**Wetlands** ▪ Crosses 2 miles of palustrine emergent and 0.2 mile of palustrine forested/shrub wetlands ▪ Would result in temporary disturbance of approximately 31 acres for palustrine emergent and 3 acres of palustrine forested/shrub wetlands and more than 1 acre of permanent disturbance each to palustrine emergent and palustrine forested/shrub wetlands **Riparian Areas** ▪ Route crosses 0.2 mile of riparian areas ▪ Without mitigation, would result in temporary disturbance of approximately 3 acres and 1 acres of permanent disturbance to riparian areas ▪ Agency-required mitigation measures applied to pipeline would include minimizing disturbance within 500 feet (153 meters) of streams, and minimizing the removal of trees in riparian areas ▪ No high or moderate residual impacts would be anticipated	**Wetlands** ▪ Crosses 0.2 more miles of palustrine emergent and the same number of miles of palustrine forested/shrub wetlands than Alternative 3A: Proposed Action ▪ Would result in temporary disturbance of 3 more acres for palustrine emergent and the same number of acres of palustrine forested/shrub wetlands and of permanent disturbance than Alternative 3A: Proposed Action **Riparian Areas** ▪ Route crosses 0.3 more miles of riparian areas than Alternative 3A: Proposed Action ▪ Would result more temporary and permanent disturbance to riparian areas ▪ Agency-required mitigation measures applied to pipeline would include minimizing disturbance within 500 feet (153 meters) of streams, and minimizing the removal of trees in riparian areas ▪ No high or moderate residual impacts would be anticipated.	**Wetlands** ▪ Same as Alternative 3B: Lost Creek to Lost Cabin **Riparian Areas** ▪ Same as Alternative 3A: Proposed Action
Wild horses and burros – refer to Section 4.3.22	▪ Crosses 14.6 miles of HMA ▪ No high or moderate residual impacts would be anticipated.	▪ Same as Alternative 3A: Proposed Action	▪ Same as Alternative 3A: Proposed Action
Wldlife – refer to Section 4.3.23 and MV13 through MV-15	**Big Game** ▪ Would result in low impacts on 24.4 miles of big game ranges ▪ No high or moderate residual impacts would be anticipated. **Migratory Birds and Bald and Golden Eagles** ▪ Would result in low impacts on 82 miles of eagle habitat because seasonal restrictions would minimize moderate or high impacts on bald and golden eagles. ▪ Preconstruction surveys would identify the most recent nest activity status, new nests, and any additional mitigation modifications needed to minimize impacts. ▪ Route crosses suitable migratory bird habitat, in particular for sagebrush bird assemblages; however, impacts on migratory birds would be anticipated to be low as construction would avoid the migratory bird nesting period; also, avoidance and intense reclamation of riparian habitats and wetlands, areas generally important to migratory birds, would be required, which would minimize effects on migratory birds ▪ No high or moderate residual impacts would be anticipated. **Special Status Wildlife** ▪ Located outside of potential yellow-billed cuckoo habitat ▪ Located outside USFWS-mapped AOI for Canada lynx **Greater Sage-Grouse** ▪ Crosses 83.2 miles of GHMA; 45.7 miles of PHMA; and no SFAs ▪ The estimated cumulative disturbance in PHMA is 3.4 percent, which is under the 5 percent of the DDCT area allowable under the Wyoming ARMPA	**Big Game** ▪ Would result in low impacts on 17.9 miles of big game ranges ▪ No high or moderate residual impacts would be anticipated. **Migratory Birds and Bald and Golden Eagles** ▪ Would result in low impacts on 71.6 miles of eagle habitat because seasonal restrictions would minimize moderate or high impacts on bald and golden eagles. ▪ Preconstruction surveys would identify the most recent nest activity status, new nests, and any additional mitigation modifications needed to minimize impacts. ▪ Route crosses suitable migratory bird habitat, in particular for sagebrush bird assemblages; however, impacts on migratory birds would be anticipated to be low as construction would avoid the migratory bird nesting period; also, avoidance and intense reclamation of riparian habitats and wetlands, areas generally important to migratory birds, would be required, which would minimize effects on migratory birds ▪ No high or moderate residual impacts would be anticipated. **Special Status Wildlife** ▪ Located outside of potential yellow-billed cuckoo habitat ▪ Located outside USFWS mapped Area of Influence for Canada lynx **Greater Sage-Grouse** ▪ Crosses 73 miles of GHMA; 38.1 miles of PHMA; and no SFAs ▪ The estimated cumulative disturbance in PHMA is 2.3 percent, which would be under the 5 percent of the DDCT area allowable under the Wyoming ARMPA	**Big Game** ▪ Would result in low impacts on 31.9 miles of big game ranges ▪ No high or moderate residual impacts would be anticipated. **Migratory Birds and Bald and Golden Eagles** ▪ Would result in low impacts on 85.9 miles of eagle habitat because seasonal restrictions would minimize moderate or high impacts on bald and golden eagles. ▪ Preconstruction surveys would identify the most recent nest activity status, new nests, and any additional mitigation modifications needed to minimize impacts. ▪ Route crosses suitable migratory bird habitat, in particular for sagebrush bird assemblages; however, impacts on migratory birds would be anticipated to be low as construction would avoid the migratory bird nesting period; also, avoidance and intense reclamation of riparian habitats and wetlands, areas generally important to migratory birds, would be required, which would minimize effects on migratory birds ▪ No high or moderate residual impacts would be anticipated. **Special Status Wildlife** ▪ Located outside of potential yellow-billed cuckoo habitat ▪ Located outside USFWS mapped Area of Influence for Canada lynx **Greater Sage-Grouse** ▪ Crosses 101.4 miles of GHMA; 49.9 miles of PHMA; and no SFAs ▪ The estimated cumulative disturbance in PHMA is 3.6 percent, which would be under the 5 percent of the DDCT area allowable under the Wyoming ARMPA

NOTE: [1]For brevity (Cultural Section), the overlapping segments of the Oregon, California, Mormon Pioneer, and Pony Express NHTs are collectively referred herein to as the "Emigrant NHTs."

THIS PAGE INTENTIONALLY LEFT BLANK

Table 2-20
Alternative Route Comparison – Utility Corridors and Jurisdiction

Alternative Route	Length (miles)	Utility Corridors (miles)	Parallel Linear Facilities (within 250 feet of centerline) (miles)				Jurisdiction (miles)		
			115-kilovolt	230-kilovolt	Unknown Voltage	Pipeline	Bureau of Land Management	State	Private
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant									
1A: Proposed Action	30.4	–	–	–	–	1.9	25.2	2.7	2.5
1A Variation: Dry Basin Draw	30.7	–	–	–	–	3.0	25.5	2.7	2.5
1B: Dry Piney	34.5	–	–	–	–	9.4	23.9	3.4	7.2
1C: Figure Four	38.5	–	–	–	–	15.5	31.9	3.5	3.1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect									
2A: Proposed Action	129.1	20.9	–	1.3	–	45.0	121.5	7.1	0.5
2B: Southern Route	136.2	20.9	–	1.3	–	69.2	123.8	2.7	9.7
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect									
3A: Proposed Action	83.2	61.7	0.3	0.6	0.3	49.6	40.3	6.7	36.2
3B: Lost Creek to Lost Cabin	73.0	72.7	0.2	0.3	–	54.6	51.0	4.4	17.6
3C: Lost Creek to Highway 20/26	101.4	101.5	0.2	0.3	0.2	51.4	50.1	8.7	42.6

THIS PAGE INTENTIONALLY LEFT BLANK

Chapter 3 – Affected Environment

Chapter 3 – Affected Environment

3.1 Introduction

This chapter describes the existing condition of the environment that could be affected by implementing the Proposed Action. In accordance with NEPA regulations codified at 40 CFR 1502.15, this section presents a summary of the existing condition of the human and natural environment in the areas that could be affected by the Proposed Action and alternative routes. This information serves as a baseline from which the impacts anticipated to result from implementing the Project were assessed.

The area of the affected environment for individual resources was assessed based on the area of potential direct and indirect environmental impacts. For most resources, the study area for resource data inventory and analysis generally includes a 2-mile-wide area comprising 1 mile in each direction from the proposed pipeline right-of-way, and any new access roads or existing roads that would require improvement (refer to Section 4.2 for description of study corridors by resource). Resource analysis that incorporates a larger (e.g., regional) study area, such as air quality and social and economic analysis, is identified in the section for the resource. The affected environment is described for the following resources:

- Air Quality (Including Greenhouse Gas Emissions and Climate Change)
- Cultural Resources
- Fish and Aquatic Resources
- Geology and Topography
- Lands and Realty
- Livestock Grazing
- Native American Concerns
- Noise
- Lands with Wilderness Characteristics
- Paleontological Resources
- Public Health and Safety
- Recreation
- Social and Economic Conditions
- Soils and Reclamation
- Special Designations
- Transportation and Access
- Vegetation
- Visual Resources
- Water Resources
- Wetlands and Riparian Areas
- Wild Horses and Burros
- Wildlife

These topics were selected based on federal regulatory requirements and policies, concerns of the lead and cooperating agencies, and/or issues derived from comments expressed by agencies and the public during scoping. Issues raised by the public and agencies during scoping are presented in Table 1-3.

Generally, each resource discussion is organized as follows:

- Regulatory Framework – A description of the resource and the laws, regulations, and policies related or relevant to management or analysis of the resource.
- Regional Setting – A description of the region particular to that resource topic
- Affected Environment – a description of present status (location, nature, condition, size, etc.) of each resource by alternative route segment.

3.1.1 Resource Inventory

Data on the existing condition of each resource were gathered and compiled, between May 2012 and April 2015, from the most recent data available—primarily literature, published and unpublished reports, land-use plans, maps, and agency databases. Following the initial inventory effort, the BLM requested other federal, state, and land and resource management agencies to refine and verify the data collected and provide information regarding additional issues, concerns, policies, and regulations. The data were compiled in GIS at scales of 1:24,000 and 1:100,000.

For most of the resources, inventories were developed to describe the existing environment in the study corridors along the alternative routes in sufficient detail to assess potential direct and indirect impacts that could result from the Project. The width of the study corridor varies for each resource based on the area that potentially could be affected (Table 3-1) and was determined by the Agency Interdisciplinary Team. Analysis of air quality is based on regional data. Data used to assess potential impacts on social and economic conditions are countywide and statewide and are not extracted for study-corridor-level analysis.

Table 3-1
Study Corridors by Resource

Resource	Study-Corridor Width (miles)
Air quality (including GHG emissions and climate change)	Refer to Notes[1]
Biological resources (vegetation, special status plants, wildlife, special status wildlife, fish, and aquatics)	2
Cultural resources	1[2]
Earth resources (geological hazards, mineral resources, soils)	2
Greater sage-grouse	8
Land use	2
National trails system	6
Lands with wilderness characteristics	2
Paleontological resources	2
Recreation and parks	2
Social and Economic Conditions	Refer to Notes[3]
Special designations and other management areas	2
Transportation and access	2
Visual resources	6
Water resources, wetlands, and riparian areas	2

NOTES:
[1]Analysis of air quality is based on regional data.
[2]The cultural resources study area is a 1-mile-wide corridor (0.5 mile on either side of the reference centerline). Refer to Section 3.2.2.3 for specific Areas of Potential Effects.
[3]Data and information used to assess potential social and economic impacts are based on countywide and statewide data and are not extracted for corridor-level assessment.

The alternative routes (and study corridors) are centered on a line referred to as the "reference centerline." Precise locations of the centerline would be refined through engineering surveys on the alternative route selected for the pipeline prior to Project construction. Maps displaying resource inventory data will be contained in Volume II – Map Volume. The results of the inventory of resources will be documented by alternative route in resource inventory summaries and maps.

3.2 Resources Analyzed

3.2.1 Air Quality (Including Greenhouse Gas Emissions and Climate Change)

This section describes air quality regulations and policy that would apply to the Project. It also describes existing ambient air quality and climatological conditions in the Project area. Because of the regional nature of air quality, the discussion includes general, relevant data from the surrounding area.

A baseline report was prepared by the Applicant in 2014 (SWCA 2014d), and reviewed and updated by the BLM to support the documentation in this section.

3.2.1.1 Regulatory Framework

The federal CAA, including all currently effective amendments, is the basis for air quality-related regulations that apply to the Project. It is codified at U.S.C. Title 42, Chapter 85, Sections 7401–7671q. The primary portions of the CAA that regulate stationary sources of air pollutant emissions are promulgated in administrative rules at 40 CFR Parts 51, 52, 60, 61, 63, and 70 through 76. Wyoming regulations also enforce CAA stationary source requirements and state-specific requirements in its Codified Regulations for the WDEQ, Wyoming Air Quality Standards and Regulations (WAQSR) Chapters 1 through 14.

The portions of the CAA that regulate air pollutant emissions from mobile sources apply to mobile equipment manufacturers and not to equipment owner-operators. Wyoming's mobile source air emissions rules require that mobile equipment be operated in accordance with applicable federal mobile source regulations. Thus, mobile source emissions regulations are not addressed in this EIS.

3.2.1.1.1 Ambient Air Quality Standards

Chapter 2 of WAQSR and 40 CFR 50 provide limits to acceptable ambient air concentrations of the following air pollutants: particulate matter with an aerodynamic diameter less than 10 microns (PM_{10}), particulate matter with an aerodynamic diameter less than 2.5 microns ($PM_{2.5}$), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), and lead. In addition to these "criteria" air pollutants (so called because they are associated with national ambient air concentration criteria), Wyoming has established state-only standards for H_2S, suspended sulfates, fluorides, and odors. As a group, these concentration standards are known as Wyoming and National Ambient Air Quality Standards (WAAQS and NAAQS). They are designed to protect public welfare and health, including the health of sensitive populations. Where Wyoming's standards and the NAAQS overlap, the WAAQS are at least as stringent as the respective NAAQS. Table 3-2 lists current WAAQS.

Table 3-2
Wyoming and National Ambient Air Quality Standards

Pollutant	Averaging Period	Wyoming Air Quality Standards (units)
PM_{10}[1]	Annual	50 (µg/m^3)
	24-hour	150 (µg/m^3)
$PM_{2.5}$[2]	Annual	12 (µg/m^3)
	24-hour	35 (µg/m^3)
SO_2	3-hour	0.5 (ppm)[3]
	1-hour	75 (ppb)[4]
NO_2	Annual	53 (ppb)[5]
	1-hour	100 (ppb)[6]
O_3	8-hour	0.070 (ppm)[7]

Table 3-2
Wyoming and National Ambient Air Quality Standards

Pollutant	Averaging Period	Wyoming Air Quality Standards (units)
CO	8-hour	9 (ppm)
	1-hour	35 (ppm)
Lead	Calendar Quarter	0.15 ($\mu g/m^3$)[8]
H_2S	1-hour	40/70[6] ($\mu g/m^3$)
Suspended Sulfates	Annual	0.25 (mg/cm^2/day)
	30-day	0.50 (mg/cm^2/day)
Fluorides	24-hour	–[9]
Odor	–[8]	–[10]

NOTES:
[1]The 24-hour PM_{10} standard is not to be exceeded more than once per year when averaged over a consecutive 3-year period. The annual PM_{10} NAAQS was revoked in 2006; Wyoming's annual PM_{10} standard remains in effect.
[2]The annual $PM_{2.5}$ standard is the annual arithmetic mean averaged over 3 years. The 24-hour $PM_{2.5}$ standard is the 3-year average of the 98th percentile of the daily 24-hour average concentration.
[3]The 3-hour SO_2 standard is not to be exceeded more than once per year.
[4]The 1-hour SO_2 standard is the 3-year average of the 99th percentile of the daily maximum 1-hour average concentration.
[5]The annual nitrogen oxides (NO_x) standard is expressed as an annual average concentration.
[6]The 1-hour NO_2 standard is the 3-year average of the 98th percentile of the daily maximum 1-hour average concentration.
[7]The ozone NAAQS was updated from 75 ppb to 70 ppb on 10/1/2015. The WAAQS will be updated to the more stringent NAAQS.
[8]Wyoming's standards for H_2S are 40 $\mu g/m^3$ (half hour average not to be exceeded more than two times in any consecutive 5-day period) and 70 $\mu g/m^3$ (half hour average not to be exceeded more than two times per year).
[9]Consult WAQSR Chapter 2, Section 9(a)(i) and (a)(ii) for statewide and regional ambient air standards for fluorides.
[10]Refer to WAQSR Chapter 2(11)(a) for specific requirements related to the ambient odor standard.
$\mu g/m^3$=micrograms per cubic meter
mg/cm^2/day = micrograms per square centimeter per day
ppb=parts per billion
ppm=parts per million

Areas with observed ambient concentrations below the NAAQS are designated as attainment areas. Areas for which no measured ambient concentration data are available are designated as unclassifiable and are assumed to be in attainment. Areas with measured ambient concentrations indicating a NAAQS violation are designated nonattainment for each specific pollutant with an observed violation. With one exception, the Project area is currently designated as either attainment or unclassifiable. An area known as the UGRB is designated as being in "marginal" nonattainment with the ozone NAAQS. The UGRB comprises parts of Lincoln and Sweetwater Counties and all of Sublette County.

The WDEQ, Air Quality Division (WDEQ-AQD), which administers Wyoming and federal air quality regulations, would allow construction of the Project's stationary air pollutant emissions sources only if the Applicant could demonstrate that associated potential air emissions would not cause or contribute to violation of a WAAQS or NAAQS.

3.2.1.1.2 New Source Review

Wyoming primarily regulates stationary source air pollutant emissions through the issuance and enforcement of air quality permits to construct and to operate. Air quality permitting requirements reside in WAQSR Chapter 6. NSR is the general term for rules related to permitting either a new emissions source or a modification to an existing source. A source is considered to be a major stationary source if its potential to emit any criteria pollutant exceeds defined threshold values. Potential criteria pollutant emission rates from the Project's stationary sources would be expected to be below all major source thresholds. Accordingly, before commencing construction on the Riley Ridge Sweetening Plant—the only substantive stationary air emissions source associated with the Project—the Applicant would be required to apply for and obtain a minor source NSR air quality permit to construct from the WDEQ-AQD.

3.2.1.1.3 Operating Permits

WDEQ-AQD requires stationary source owners to apply for and obtain an operating permit within a given period after construction is completed and operation of the source begins. Sources that qualify as major stationary sources with respect to Title V, Part 70 of the CAA must obtain a Title V operating permit in accordance with WAQSR Chapter 6, Section 3. Other sources must obtain a Wyoming operating permit in accordance with WAQSR Chapter 6, Section 2.

3.2.1.1.4 New Source Performance Standards

Section 111 of the CAA requires that the EPA establish and periodically update technology-based emissions standards for new—and in limited circumstances, existing—stationary emissions sources that belong to identified source categories. The EPA does this through a set of source-category-specific New Source Performance Standards (NSPS) promulgated within 40 CFR Part 60. NSPS typically limit emissions of criteria air pollutants, but they can apply to other non- HAPs in some cases. WDEQ-AQD administers these regulations under WAQSR Chapter 5. If the Riley Ridge Sweetening Plant portion of the Project were to include any equipment or activities included within an NSPS source category, those equipment or activities would be subject to the limits and conditions of the relevant standards.

3.2.1.1.5 National Emission Standards for Hazardous Air Pollutants

National Emission Standards for Hazardous Air Pollutants (NESHAP) are analogous to NSPS and apply to stationary sources that emit HAPs. They are based on Section 112 of the CAA and implemented as source-category-specific regulations within 40 CFR Part 63. As with NSPS, WDEQ-AQD administers NESHAPs under WAQSR Chapter 5. NESHAPs are sometimes referred to as "maximum achievable control technology" standards because the level of pollutant emissions allowed for each regulated activity or equipment is based on a determination of maximum achievable control technology for a given HAP or class of HAPs when emitted from a specific source type.

NESHAPs generally apply to "major" stationary sources of HAP emissions as defined in the rules, though a few also apply to "area" sources (i.e., sources that are not major). The Riley Ridge Sweetening Plant portion of the Project is not expected to qualify as a major source of HAP emissions. If that were not the case, however, and if it were subject to a major source NESHAP, or if it were subject to an area source NESHAP, the facility owner would be required to comply with all applicable limits and conditions.

3.2.1.1.6 Conformity for General Federal Actions

Per the CAA, Section 176(c), federal agencies that would undertake some action within a nonattainment area or within an area that has been redesignated from nonattainment to attainment (known as a "maintenance area") must demonstrate that it would conform to the state's—or in the case of an Indian reservation, the tribe's—nonattainment or maintenance plan for the area. These plans are known as State or Tribal Implementation Plans. If the proposed federal action is related to a transportation project, the requirements and analysis process are contained in the Transportation Conformity Rule (40 CFR 51, Subpart T). If, as is the case with the Project, the federal action is not a transportation project, the agency must comply with general conformity requirements under WAQSR Chapter 8, Section 3.

Per WAQSR Chapter 8, Section 3(c)(iv)(A), a federal conformity determination is not required for "[t]he portion of an action that includes major or minor new or modified stationary sources that require a permit under the NSR program…" Before issuing permits to construct and to operate the Riley Ridge Sweetening Plant portion of the Project, WDEQ-AQD would be responsible for conducting a NSR assuring that the facility would meet all requirements associated with the UGRB ozone nonattainment area. The BLM would still be required to conduct an appropriate general conformity analysis to ensure

that construction and operation of the portions of the proposed CO_2 pipeline within the nonattainment area would conform to Wyoming's plans for bringing the area back into attainment.

3.2.1.1.7 State Regulations

As noted above, WDEQ-AQD administers the portions of the federal CAA that apply to stationary air pollutant sources under portions of WAQSR Chapters 1 through 14. The WAQSR also contain state-only regulations.

WDEQ-AQD has published an "Interim Policy on Demonstration of Compliance with WAQSR Chapter 6, Section 2(c)(ii) for sources in Sublette County" (WDEQ 2008). The policy addresses the requirement that any new or modified emissions source requesting a permit to construct must demonstrate that the proposed source "will not prevent the attainment or maintenance of any ambient air quality standard." A unique approach to satisfying this requirement is necessary because Sublette County is designated as being in marginal nonattainment of the 8-hour ozone NAAQS and because modeling demonstrations of ozone concentration impacts are technically challenging. The policy offers three acceptable alternatives for making the required demonstration. The primary alternative, which the Department identifies as "the most practical," is to offset expected emissions of VOCs and NO_x at prescribed ratios.

3.2.1.2 Regional Setting

The Project area is in a semi-arid (dry and cold), mid-continental climate regime. The Project area is typified by dry, windy conditions with low annual precipitation, and long, cold winters. The Wind River Range lies to the north of Segment 1, with peak elevations of approximately 13,800 feet above sea level. The Wyoming Range lies to the west of Segment 1, with peak elevations of 11,500 feet above sea level.

The areas in and adjacent to the Proposed Action and its alternative routes are classified as PSD Class II areas (40 CFR 52.1382). PSD Class II areas allow for moderate growth or degradation of air quality from baseline levels within certain limits. The Project area is within 180 miles of several sensitive airsheds, known as Class I areas, specially designated in accordance with the CAA. The Class I areas closest to the Project (in order of proximity) include the following:

- Bridger Wilderness (23 miles from Segment 2)
- Fitzpatrick Wilderness Area (44 miles from Segment 2)
- Grand Teton National Park (73 miles from Segment 1)
- Washakie Wilderness Area (88 miles from Segment 1)
- Grand Teton National Park (90 miles from Segment 2)

The Bridger and Fitzpatrick Wilderness Areas are the closest Class I areas to the Project area and are also the closest areas at which visibility impairment, an important indicator of atmospheric particulate matter concentrations, is measured. Per the USFS, visibility has improved for these areas by approximately 4 percent on average from 2000 to 2009 and is on track to meet a federal CAA goal of achieving natural background conditions by 2064 (USFS 2013). In contrast, scientists have noted increasing adverse effects resulting from anthropogenic sources of atmospheric deposition in the Greater Yellowstone Area, which encompasses the Bridger and Fitzpatrick Wilderness Areas (USFS 2014).

In addition, the BLM, and other agencies, identified two additional nearby areas as "Sensitive Class II Areas." They are the Wind River Reservation (22 miles from Segment 3 at its closest point), and the Popo Agie Wilderness Area (27 miles from Segment 2 at its closest point).

Climatological conditions presented in Table 3-3, Table 3-4, Table 3-5, and Table 3-6 below are from the Big Piney, Rock Springs, South Pass, and Casper meteorological stations, and are considered

representative of the Project area for this analysis. Predominant wind speeds and directions are presented in Figure 3-1 through Figure 3-4 for these locations. Variations in elevation and topography across the analysis area result in variations in climatic conditions; therefore, site-specific conditions in the Project area will vary slightly from those reported below.

Table 3-3
Climatological Conditions (August 1, 1948, to November 5, 2014) for Big Piney, Wyoming

Parameter	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Average maximum temperature (Fahrenheit)	26.0	30.3	39.0	51.1	62.0	71.1	80.1	78.6	69.6	57.6	39.6	28.3	52.8
Average minimum temperature (Fahrenheit)	-5.0	-1.6	8.6	19.6	29.0	36.3	40.0	36.5	27.5	18.0	7.1	-3.0	17.7
Average total precipitation (inches)	0.38	0.31	0.43	0.64	1.03	0.89	0.74	0.78	0.81	0.54	0.38	0.39	7.30
Average total snowfall (inches)	4.1	4.2	4.3	3.6	1.3	0.2	0.0	0.0	0.7	2.1	4.2	3.9	28.6
Average snow depth (inches)	No Data												

SOURCE: Western Regional Climate Center (WRCC) 2015

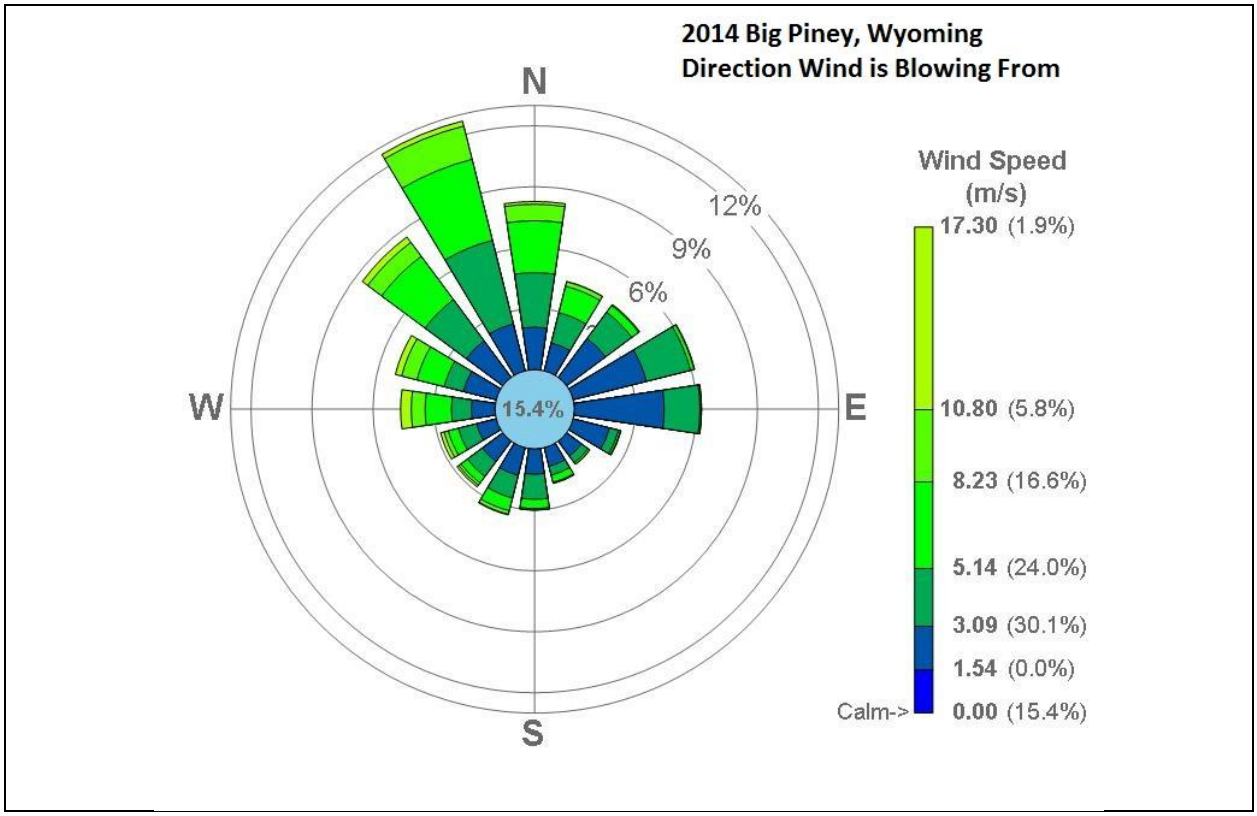


Figure 3-1 Big Piney, Wyoming – Wind Rose

Table 3-4
Climatological Conditions (January 1, 1948 to January 20, 2015) for Rock Springs, Wyoming

Parameter	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Average maximum temperature (Fahrenheit)	29.3	33.4	42.0	52.9	63.6	74.6	83.5	81.1	70.7	57.2	40.5	30.8	55.0
Average minimum temperature (Fahrenheit)	11.4	14.4	21.2	28.8	37.4	46.0	53.4	51.5	42.2	32.0	20.5	12.8	31.0
Average total precipitation (inches)	0.50	0.50	0.66	0.95	1.20	0.86	0.67	0.62	0.76	0.82	0.55	0.51	8.61
Average total snowfall (inches)	6.9	5.7	6.8	5.8	2.0	0.1	0.0	0.0	0.7	4.0	5.6	6.1	43.6
Average snow depth (inches)	2	2	1	0	0	0	0	0	0	0	1	2	1

SOURCE: WRCC 2015

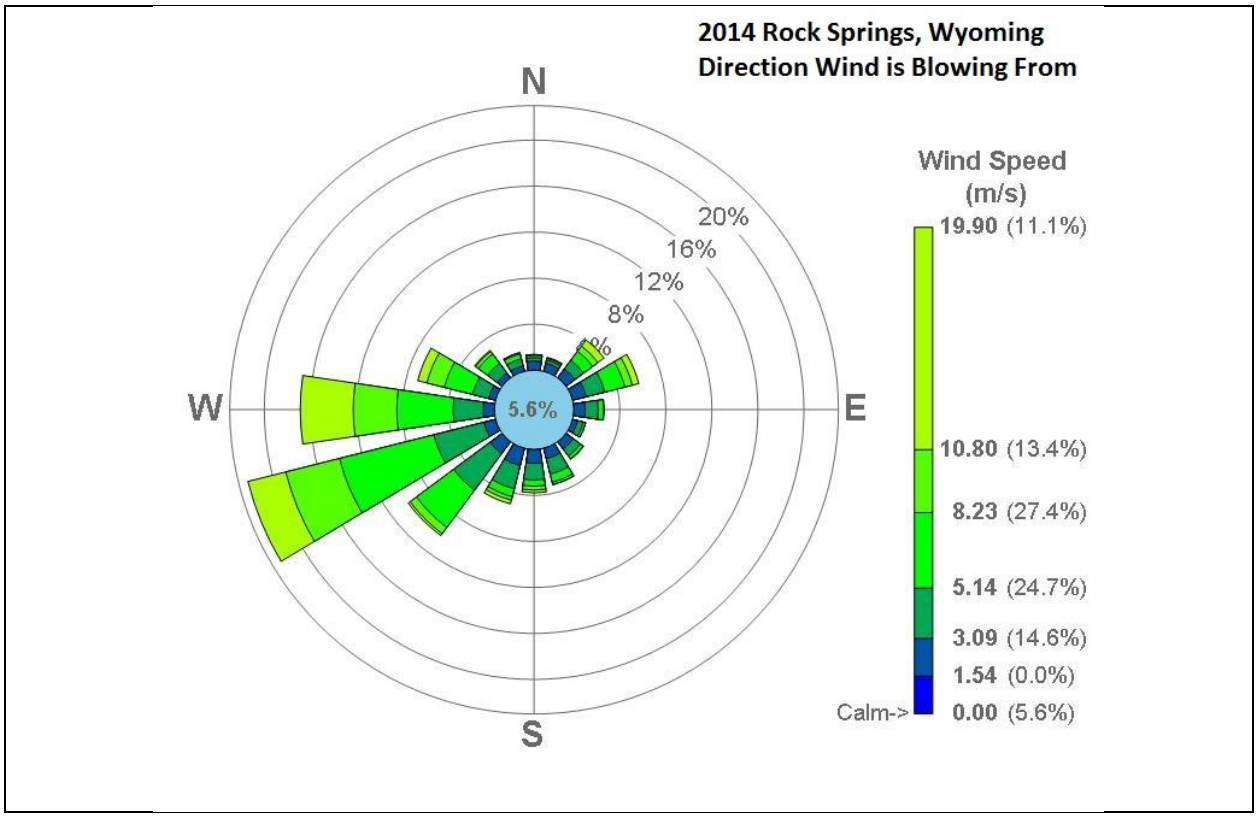


Figure 3-2 Rock Springs, Wyoming – Wind Rose

Table 3-5
Climatological Conditions (January 1, 1948 to January 8, 2015) for South Pass, Wyoming

Parameter	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Average maximum temperature (Fahrenheit)	25.8	28.1	33.9	45.4	57.3	67.5	76.4	75.0	65.3	52.9	37.4	27.8	49.4
Average minimum temperature (Fahrenheit)	1.2	3.3	9.3	19.9	28.0	34.4	40.1	38.2	30.1	21.6	11.1	3.3	20.0
Average total precipitation (inches)	1.24	1.00	1.16	1.40	1.54	1.28	0.86	0.88	0.99	1.03	0.91	1.06	13.34
Average total snowfall (inches)	18.2	15.8	17.6	16.4	7.2	0.8	0.0	0.0	1.9	8.6	13.2	15.3	115.0
Average snow depth (inches)	18	18	17	6	1	0	0	0	0	0	4	9	6

SOURCE: WRCC 2015

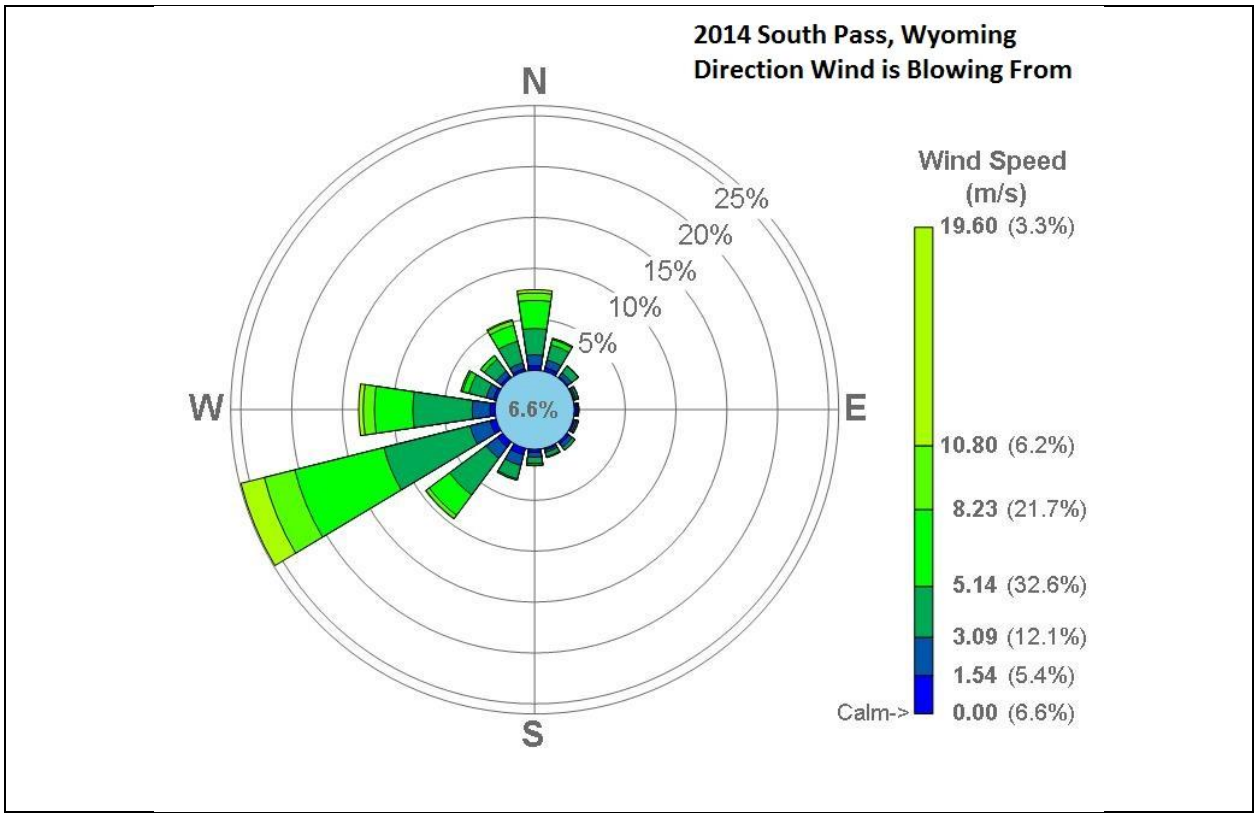


Figure 3-3 South Pass, Wyoming – Wind Rose

Table 3-6
Climatological Conditions (January 1, 1948 to January 8, 2015) for Casper, Wyoming

Parameter	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Average maximum temperature (Fahrenheit)	33.8	37.7	46.1	56.2	66.7	78.7	87.8	85.9	74.5	60.4	44.6	35.1	59.0
Average minimum temperature (Fahrenheit)	13.1	16.3	21.8	29.3	38.3	46.9	54.2	52.5	42.4	32.5	22.2	15.0	32.0
Average total precipitation (inches)	0.51	0.56	0.88	1.39	2.09	1.40	1.22	0.70	0.93	1.01	0.70	0.56	11.95
Average total snowfall (inches)	10.1	10.0	12.6	11.8	3.8	0.2	0.0	0.0	1.3	6.2	9.9	10.4	76.3
Average snow depth (inches)	1	1	1	0	0	0	0	0	0	0	1	1	0

SOURCE: WRCC 2015

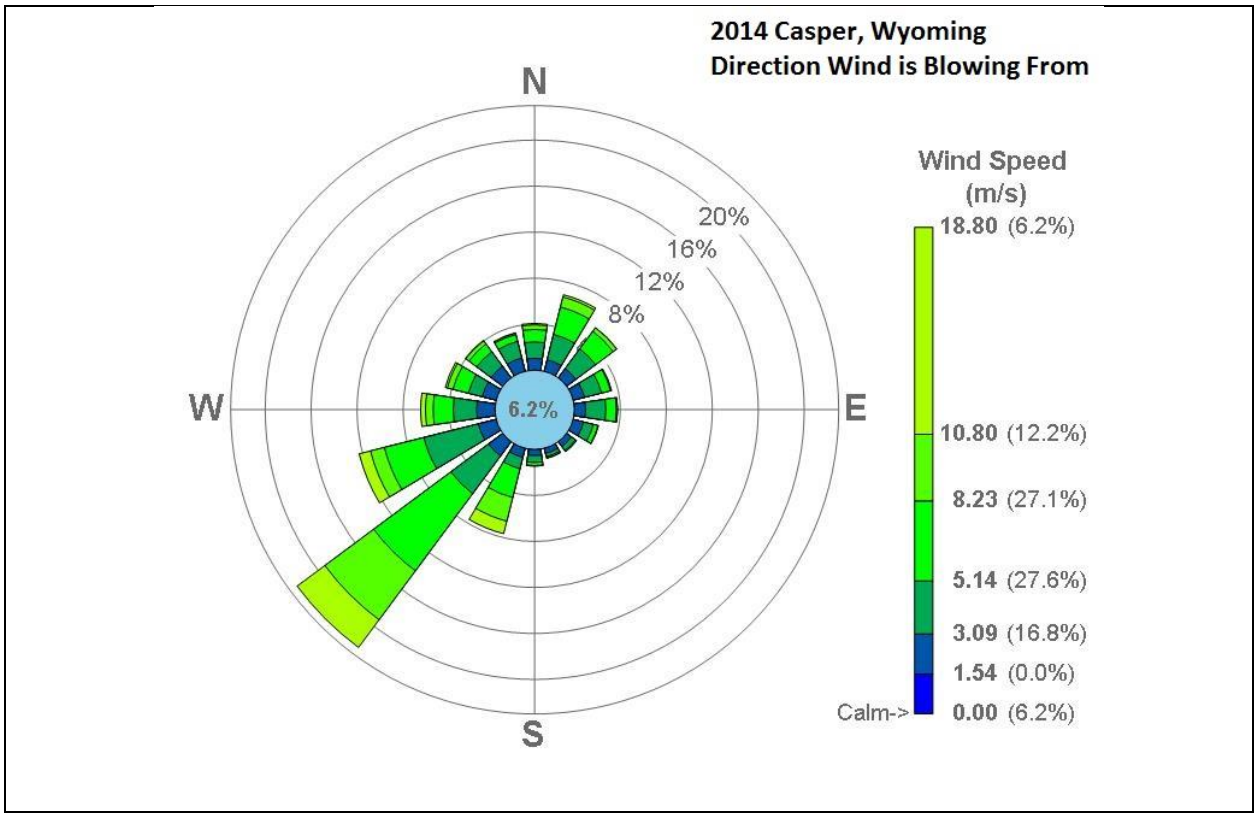


Figure 3-4 Casper, Wyoming – Wind Rose

On average, July is the warmest month, with an average maximum temperature ranging from 76.4 to 87.8 degrees Fahrenheit at the three sites. January is the coldest month with an average minimum

temperature ranging from 1.2 to 13.1 degrees Fahrenheit. Average monthly precipitation is greatest in May with 1.2 to 2.09 inches of rainfall. Average snowfall amounts range from 5.6 inches to 18.2 inches from November through April.

3.2.1.3 Existing Air Quality

Existing air quality conditions in the areas surrounding the Proposed Action and its alternative routes are designated as in attainment with ambient air quality standards, except for the Upper Green River Ozone Non-attainment area.

WDEQ operates several air quality monitors near the Project area (WDEQ n.d.). Ozone is a pollutant of primary concern due to the non-attainment designation in the UGRB. Several ozone monitors are operating in the Project area in each county along the alternative route segments. Other criteria pollutants such as $PM_{2.5}$ and PM_{10}, CO, NO_2, and SO_2 are also monitored at various locations. Recent data from the following monitors were used to characterize existing air quality in the Project area (Table 3-7).

Table 3-7
Existing Air Quality in Project Area

Site Name	Identification Number	County	Pollutants Measured	Location	
				Longitude	Latitude
Big Piney	56-035-0700	Sublette	O_3, PM_{10}, $PM_{2.5}$, NO_2	42.487	-110.099
Boulder	56-035-0099	Sublette	O_3, PM_{10}, NO_2	42.719	-109.753
Daniel South	56-035-0100	Sublette	O_3, PM_{10}, NO_2	42.791	-110.055
Juel Spring	56-035-1002	Sublette	O_3, NO_2	42.373	-109.563
Pinedale	56-035-0101	Sublette	O_3, $PM_{2.5}$, NO_2	42.853	-109.885
Wyoming Range	56-035-0097	Sublette	O_3	42.980	-110.353
Hiawatha	56-037-0077	Sweetwater	O_3	41.158	-108.619
Moxa Arch	56-037-0300	Sweetwater	O_3, PM_{10}, NO_2, SO_2	41.751	-109.788
Rock Springs – SLAMS	56-037-0007	Sweetwater	PM_{10}, $PM_{2.5}$	41.592	-109.221
Rock Springs – TATA Gaseous	56-037-0870	Sweetwater	CO	41.589	-109.761
Wamsutter	56-037-0020	Sweetwater	O_3, PM_{10}, NO_2	41.678	-108.024
South Pass	56-013-0099	Fremont	O_3, PM_{10}, NO_2	42.528	-108.720
Casper	56-025-0100	Natrona	O_3, PM_{10}, NO_2, SO_2	42.822	-106.365

SOURCES: WDEQ 2015b, EPA 2015e

Detailed emissions inventory and ambient concentration monitoring information for each segment is presented in the following sections.

3.2.1.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Segment 1 is entirely within Sublette County. Emissions inventory and monitoring data available for Sublette County is considered representative of the general air quality of Segment 1 and is presented in this section.

3.2.1.3.1.1 Emissions Inventories

Table 3-8 provides anthropogenic emission totals for criteria pollutants for Sublette County. The emission totals are based on the 2011 National Emission Inventory (NEI), which is a record of historical emissions information reported to the EPA every 3 years by the states (EPA 2015f). Historical emissions data from 2014 were not available from the EPA's NEI website at the time of this analysis.

The major emission source categories include area sources (e.g., low-level minor point sources), non-road sources (e.g., construction equipment, off-road RV), onroad mobile sources (e.g., cars and trucks), and point sources (major sources with elevated stacks).

Table 3-8 and Table 3-9 indicate that the majority of emissions in Sublette County are from area sources, which comprise numerous low-level point and other sources associated with oil and natural gas development in the county.

Table 3-8
Criteria Pollutant Inventory for 2011 (tons per year) for Sublette County, Wyoming

County	Source	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC
Sublette	Area	2,326	2379	45	17854	2,009	9,180
	Nonroad Mobile	1,635	214	1	29	28	526
	Onroad	2,692	621	3	35	21	249
	Point	874	1,344	163	109	85	1,316

SOURCE: EPA 2015f

Table 3-9
Hazardous Air Pollutants Inventory for 2011 (tons per year) for Sublette County, Wyoming

County	Source	Total Hazardous Air Pollutants
Sublette	Area	6784
	Nonroad Mobile	143
	Onroad	78
	Point	175

SOURCE: EPA 2015f

WDEQ's overall emissions totals indicate that the majority of gaseous pollutant emissions, especially those of NO_x and VOCs, are from oil and gas development sources. PM emissions are primarily generated by vehicular traffic on paved and unpaved roadways.

Table 3-10 summarizes 2013 emissions for Sublette County from activities and sources associated with oil and gas production and development. These data are from an emissions inventory developed by WDEQ.

Table 3-10
Criteria Pollutant Inventory for 2013 (tons per year) for
Sublette County, Wyoming, Oil and Gas Development Activities

County	Source	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC
Sublette	Completions and workovers	110	303	90	7	4	50
	Dehydration unit	44	175	–	–	–	1,411
	Drill rigs	228	194	31	20	6	37
	Fugitives	–	–	–	–	–	3,449
	Heaters	438	521	3	39	39	29
	Pneumatic pump	25	100	–	–	–	2,097
	Stationary engine	135	129	–	12	12	56
	Tanks and pressurized vessels	14	57	–	–	–	4,483
	Truck loading	–	–	–	–	–	133
	Venting and blowdown	1	3	–	–	–	75
	Total	995	1,482	124	78	61	11,821

SOURCE: WDEQ 2015b

3.2.1.3.1.2 Hazardous Air Pollutant Monitoring

Many VOCs are HAPs. The NEI and WDEQ emissions inventories indicate that VOC emissions along the proposed and alternative route segments are primarily from area sources associated with oil and gas development. Consequently, HAP concentrations are expected to be greatest near oil and gas development sources.

WDEQ conducted HAP ambient concentration monitoring for several sites from February 2009 until March 2010 in Sublette County. Table 3-11 summarizes observed HAP concentrations for the Boulder, Daniel South, and Pinedale monitoring sites. The presented values are averages for the entire monitoring period.

Table 3-11
Hazardous Air Pollutants Concentrations for Sublette County, Wyoming (February 2009 to March 2010)

Site Name	Annual Average Hazardous Air Pollutants Concentration (µg/m^3)					
	Benzene	Ethyl-benzene	Formaldehyde	Hexane	Toluene	Xylene
Boulder	2.12	0.77	0.99	1.29	6.42	4.46
Daniel South	1.25	0.52	1.37	0.81	4.30	2.76
Pinedale	2.13	1.00	1.59	1.47	6.50	6.38

SOURCE: BLM 2014b

No HAP concentration monitoring data are available for areas near Segments 2 and 3.

3.2.1.3.1.3 Carbon Monoxide Monitoring

There are no active CO monitoring sites in Sublette County. The Rock Springs site in Sweetwater County is the closest site to this segment. CO background concentrations for Rock Springs are summarized in Section 3.2.1.3.2.

3.2.1.3.1.4 Ozone Monitoring

Segment 1 is in the UGRB ozone non-attainment area. Compliance with the 8-hour ozone NAAQS is based on the ozone "design value," which is defined as the 3-year average of the annual fourth-highest observed 8-hour average ozone concentrations. Ambient ozone concentrations in Sublette County are measured at the Big Piney, Boulder, Daniel South, Juel Spring, Pinedale, and Wyoming Range monitoring stations. The following table presents the ozone background monitoring data available for these sites.

Table 3-12
Ozone Concentrations for Sublette County, Wyoming (2009 to 2014)

Site Name	8-hour NAAQS (ppb)	2009 to 2011 Design Value (ppb)	2010 to 2012 Design Value (ppb)	2011 to 2013 Design Value (ppb)	2012 to 2014 Design Value (ppb)
Boulder	70[1]	78	78	76	62
Daniel South		66	68	68	64
Pinedale Gaseous		–	68	68	61
Big Piney		–	–	64	63
Juel Spring		–	68	68	64
Wyoming Range		–	–	65	

SOURCE: EPA 2015b
NOTE: In October of 2015, the ozone NAAQS was lowered from the 2008 standard of 75 ppb (with the same averaging criteria). The monitoring data shown in this table should be compared against the 2008 standard.

As shown in the table above, 8-hour ozone NAAQS exceedances were observed only at the Boulder site, though all of Sublette County is within the UGRB ozone nonattainment area. The 2012-to-2014 design values for all the monitoring sites in Sublette County were below both the 2008 (75 ppb) and 2015 (70 ppb) ozone standards. Although the most recent design values demonstrate compliance with the standard, the UGRB will remain an ozone nonattainment area until Wyoming satisfies a variety of redesignation requirements. These include demonstrating that the improvement in air quality is due to permanent and enforceable emission reductions rather than meteorological conditions or temporarily reduced production. Wyoming will also need to submit a 10-year maintenance plan, including a contingency plan, specifically describing how the UGRB will continue to maintain the standard for at least 10 years.

3.2.1.3.1.5 Particulate Matter Monitoring

The Big Piney, Boulder, and Daniel South sites monitor PM_{10} concentrations in Sublette County. Table 3-13 summarizes monitored PM_{10} concentrations for these sites.

Table 3-13
PM_{10} Concentrations for Sublette County, Wyoming (2012 to 2014)

Site Name	24-hour NAAQS (µg/m³)[1]	2012 (µg/m³)		2013 (µg/m³)		2014 (µg/m³)		Actual Exceedances
		First Maximum	Second Maximum	First Maximum	Second Maximum	First Maximum	Second Maximum	
Big Piney	150 µg/m³	145	138	59	53	No data	No data	0
Boulder		68	62	41	39	31	27	0
Daniel South		72	67	41	26	26	25	0

SOURCE: EPA 2015a
NOTE: [1]EPA revoked the annual PM_{10} NAAQS in 2006. Wyoming's annual PM_{10} standard of 50 µg/m³ is still in effect.

The PM_{10} 24-hour standard is not to be exceeded more than once per year on average more than 3 years. The Sublette County monitors have consistently demonstrated compliance with the PM_{10} NAAQS, and Sublette County is in attainment for PM_{10}.

The Big Piney site monitors for $PM_{2.5}$ in Sublette County. Table 3-14 and Table 3-15 summarize the $PM_{2.5}$ concentrations for this site.

Table 3-14
Annual $PM_{2.5}$ Concentrations for Sublette County, Wyoming (2011 to 2013)

Site Name	Annual NAAQS (µg/m3)	2009 to 2011 Annual Standard Design Value (µg/m³)	2010 to 2012 Annual Standard Design Value (µg/m³)	2011 to 2013 Annual Standard Design Value (µg/m³)
Big Piney	12 µg/m³	2.9	No data	4.3

SOURCE: EPA 2015b

The $PM_{2.5}$ standard of 12 µg/m³ is the annual mean, averaged more than 3 years. Sublette County is in attainment for the annual $PM_{2.5}$ standard.

Table 3-15
24-hour $PM_{2.5}$ Concentrations for Sublette County, Wyoming (2011 to 2013)

Site Name	24-hour NAAQS (µg/m3)	2011 24-hour 98th Percentile (µg/m³)	2012 24-hour 98th Percentile (µg/m³)	2013 24-hour 98th Percentile (µg/m³)
Big Piney	35 µg/m³	14	14	9

SOURCE: EPA 2015b

The 24-hour $PM_{2.5}$ standard of 35 µg/m^3 is the 98th percentile, averaged more than 3 years. Sublette County is in attainment for the 24 hour $PM_{2.5}$ standard.

3.2.1.3.1.6 Sulfur Dioxide Monitoring

There are no active SO_2 monitors in Sublette County. The Moxa Arch site in Sweetwater County is the closest active monitoring site to this segment. Background SO_2 data for this area are presented in Section 3.2.1.3.2.

3.2.1.3.1.7 Nitrogen Dioxide Monitoring

Nitrogen dioxide is monitored at the Boulder, Daniel South, Pinedale, and Juel Spring sites in Sublette County. The tables below summarize the NO_2 design value data for these sites.

Table 3-16
Nitrogen Dioxide Annual Concentrations for Sublette County, Wyoming (2011 to 2013)

Site Name	Annual NAAQS (ppb)	2011 Design Value	2012 Design Value	2013 Design Value
Boulder	53 ppb	2	3	2
Daniel South		0	0	1
Pinedale		3	3	1
Juel Spring		2	1	1

SOURCE: EPA 2015b

The annual NAAQS for NO_2 is 53 ppb not to be exceeded during the year. The NO_2 monitoring sites in Sublette County have consistently demonstrated compliance with the annual NAAQS.

Table 3-17
Nitrogen Dioxide 1-hour Concentrations for Sublette County, Wyoming (2009 to 2013)

Site Name	1-hour NAAQS (ppb)	2009 to 2011 Design Value (ppb)	2010 to 2012 Design Value (ppb)	2011 to 2013 Design Value (ppb)
Boulder	100 ppb	45	37	30
Daniel South		–	–	–
Pinedale		–	30	25
Juel Spring		–	13	12

SOURCE: EPA 2015b

The hourly NAAQS for NO_2 is 100 ppb based on the 98th percentile value averaged more than 3 consecutive years of data. The NO_2 monitoring sites in Sublette County have consistently demonstrated compliance with the NO_2 1-hour NAAQS.

3.2.1.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Segment 2 passes through Sublette, Sweetwater and Fremont counties. Most of this segment is in Sweetwater County. Emissions inventory and monitoring data for Sublette and Fremont counties are presented in Sections 3.2.1.3.1 and 3.2.1.3.3.

3.2.1.3.2.1 Emissions Inventories

Table 3-18 provides anthropogenic emission totals for criteria pollutants for Sweetwater County. The emission totals are based on the 2011 NEI, which is a record of historical emissions information reported to EPA every 3 years by the states (EPA 2015f). Historical emissions data from 2014 were not available from EPA's NEI website at the time of this analysis.

The major emission source categories include area sources (e.g., low-level minor point sources), non-road sources (e.g., construction equipment, off-road RVs), onroad mobile sources (e.g., cars and trucks), and point sources (major sources with elevated stacks).

Table 3-18
Criteria Pollutant Inventory for 2011 (tons per year) for Sweetwater County, Wyoming

County	Source	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC
Sweetwater	Area	14,643	5,992	73	9,398	1,220	86,763
	Nonroad Mobile	1,927	200	1	18	18	292
	Onroad	11,083	6,932	13	274	216	1,375
	Point	22,375	25,159	20,373	9,328	4,536	8,940

SOURCE: EPA 2015e

Table 3-19
Hazardous Air Pollutants Inventory for 2011 (tons per year) for Sweetwater County, Wyoming

County	Source	Total HAPs
Sweetwater	Area	15,039
	Nonroad Mobile	69
	Onroad	363
	Point	1,052

SOURCE: EPA 2015e

Table 3-18 and Table 3-19 indicate that the majority of emissions in Sublette County are from area sources, which comprise numerous low-level point and other sources associated with oil and natural gas development in the county.

WDEQ's overall emissions totals indicate that the majority of gaseous pollutant emissions, especially those of NO_X and VOCs, are from oil and gas development sources. PM emissions are primarily generated by vehicular traffic on paved and unpaved roadways,

Table 3-20 summarizes 2013 emissions for Sweetwater County from activities and sources associated with oil and gas production and development. These data are from an emissions inventory developed by WDEQ.

Table 3-20
Criteria Pollutant Inventory for 2013 (tons per year)
for Sweetwater County, Wyoming, Oil and Gas Development Activities

County	Source	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC
Sweetwater	Completions and Workovers	–	–	–	–	–	0
	Dehydration Unit	–	–	–	–	–	154
	Drill Rigs	–	–	–	–	–	-
	Fugitives	–	–	–	–	–	293
	Heaters	96	115	1	9	9	6
	Pneumatic Pump	–	–	–	–	–	523
	Stationary Engine	49	31	1	–	1	2
	Tanks and Pressurized Vessels	–	–	–	–	–	511
	Truck Loading	–	–	–	–	–	2
	Venting and Blowdown	–	–	–	–	–	131
	Total	146	146	1	9	10	1,623

SOURCE: WDEQ 2015b

3.2.1.3.2.2 Carbon Monoxide Monitoring

Carbon monoxide is monitored at the Rock Springs site. Table 3-21 summarizes the background CO concentrations measured at this site.

Table 3-21
Carbon Monoxide Concentrations for Sweetwater County, Wyoming (2011 to 2013)

Site Name	NAAQS (ppm)	2011 Design Value (ppm)	2012 Design Value (ppm)	2013 Design Value (ppm)	Actual Exceedances
Rock Springs – TATA Gaseous	1-hour: 35	1.2	1.2	No Data	0
	8-hour: 9	0.9	1.0	No Data	0

SOURCE: EPA 2015b

The 1-hour NAAQS for CO is 35 ppm not to be exceeded more than once per year. The 8-hour CO NAAQS is 9 ppm not to be exceeded more than once per year. Monitoring data demonstrates compliance with the NAAQS, and Sweetwater County is an attainment area for CO.

3.2.1.3.2.3 Ozone Monitoring (O_3)

A portion of Segment 2 is in the UGRB ozone non-attainment area. Ozone is measured at the Hiawatha, Moxa Arch, and Wamsutter sites in Sweetwater County. The following table summarizes ozone background monitoring data available for these sites.

Table 3-22
Ozone Concentrations for Sweetwater County, Wyoming (2009 to 2014)

Site Name	8-hour NAAQS[1] (ppb)	2009 to 2011 Design Value (ppb)	2010 to 2012 Design Value (ppb)	2011 to 2013 Design Value (ppb)	Exceedance Days
Hiawatha	70	Incomplete Data	Incomplete Data	64	0
Moxa Arch		Incomplete Data	Incomplete Data	66	0
Wamsutter		64	64	63	0

SOURCE: EPA 2015b
NOTE: [1]In October of 2015, the ozone NAAQS was lowered from the 2008 standard of 75 ppb (with the same averaging criteria). The monitoring data shown in this table should be compared against the 2008 standard.

As shown in the table above, Sweetwater County monitors have demonstrated attainment with the 2008 8-hour ozone NAAQS. The northwest portion of Sweetwater County, part of the UGRB air shed, was designated as an ozone nonattainment area in 2012 based on monitoring data collected before 2009.

3.2.1.3.2.4 Particulate Matter Monitoring

The Moxa Arch and Wamsutter sites monitor PM_{10} concentrations in Sweetwater County. Table 3-23 summarizes monitored PM_{10} monitoring for these sites.

Table 3-23
PM_{10} Concentrations for Sweetwater County, Wyoming (2013 to 2014)

Site Name	24-hour NAAQS[1] (µg/m³)	2012 (µg/m³)		2013 (µg/m³)		2014 (µg/m³)		Actual Exceedances
		First Maximum	Second Maximum	First Maximum	Second Maximum	First Maximum	Second Maximum	
Moxa Arch	150 µg/m³	152	149	79	75	67	54	0
Wamsutter		72	60	193	50	41	38	1 to 2013

SOURCE: EPA 2015a
NOTE: [1]EPA revoked the annual PM_{10} NAAQS in 2006. Wyoming's annual PM_{10} standard of 50 µg/m³ is still in effect.

The PM_{10} 24-hour standard is not to be exceeded more than once per year on average more than 3 years. The Sweetwater County monitors have consistently demonstrated compliance with the PM_{10} NAAQS, and Sweetwater County is in attainment for PM_{10}.

The Rock Springs site monitors for $PM_{2.5}$ in Sweetwater County. Table 3-24summarizes the $PM_{2.5}$ concentrations for this site.

Table 3-24
Annual $PM_{2.5}$ Concentrations for Sweetwater County, Wyoming (2011 to 2013)

Site Name	Annual NAAQS (µg/m³)	2011 to 2013 Annual Design Value (µg/m³)	24-hour NAAQS (µg/m³)	2011 to 2013 24-hour Design Value(µg/m³)
Rock Springs SLAM Site	12 µg/m³	5.7	35 µg/m³	17

SOURCE: EPA 2015b

The $PM_{2.5}$ standard of 12 µg/m³ is the annual mean, averaged more than 3 years. The 24-hour $PM_{2.5}$ standard of 35 µg/m³ is the 98th percentile, averaged more than 3 years. Sweetwater County is in attainment for the annual and 24 hour $PM_{2.5}$ standards.

3.2.1.3.2.5 Sulfur Dioxide Monitoring

The Moxa Arch air quality monitoring station measures ambient SO_2 concentrations in Sweetwater County. Table 3-25 summarizes the SO_2 design value data for this site.

Table 3-25
Sulfur Dioxide Concentrations for Sweetwater County, Wyoming (2011 to 2013)

Site Name	NAAQS Time Period	NAAQS (ppb)	2012 through 2014 1-Hour Design Value (ppb)
Moxa Arch	1 hour	75	16
	3 hour	500	–

SOURCE: EPA 2015b
NOTE: The 3-hour standard is a secondary NAAQS for summary monitoring.

The 1-hour NAAQS for SO_2 is 75 ppb calculated as the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour average concentrations. The 3-hour secondary standard is not to be exceeded more than once per year. The Moxa Arch SO_2 monitoring site in Sweetwater County has consistently demonstrated compliance with the NAAQS.

3.2.1.3.2.6 Nitrogen Dioxide Monitoring

Nitrogen dioxide is monitored at the Wamsutter and Moxa Arch monitoring sites in Sweetwater County. Table 3-26 and Table 3-27 summarize the NO_2 design value data for these sites.

Table 3-26
Nitrogen Dioxide Annual Concentrations for Sweetwater County, Wyoming (2011 to 2013)

Site Name	Annual NAAQS (ppb)	2011 Design Value	2012 Design Value	2013 Design Value
Wamsutter	53 ppb	4	5	4
Moxa Arch		2	2	2
SOURCE: EPA 2015b				

The annual NAAQS for NO_2 is 53 ppb not to be exceeded during the year. The NO_2 monitoring sites in Sweetwater County have consistently demonstrated compliance with the annual NO_2 NAAQS.

Table 3-27
Nitrogen Dioxide 1-hour Concentrations for Sweetwater County, Wyoming (2009 to 2013)

Site Name	1-hour NAAQS (ppb)	2007 to 2009 Design Value (ppb)	2008 to 2010 Design Value (ppb)	2009 to 2011 Design Value (ppb)	2010 to 2012 Design Value (ppb)	2011 to 2013 Design Value (ppb)
Wamsutter	100 ppb	41	39	39	No data	No data
Moxa Arch		No data	No data	No data	No data	22
SOURCE: EPA 2015b						

The hourly NO_2 NAAQS is 100 ppb based on the 98th percentile value averaged more than 3 consecutive years of data. The NO_2 monitoring sites near this segment have consistently demonstrated compliance with the 1 hour NO_2 NAAQS.

3.2.1.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Segment 3 passes through Fremont and Natrona Counties. Emissions inventory and monitoring data available for both counties is considered representative of the general air quality of Segment 3 and is presented in this section.

3.2.1.3.3.1 Emissions Inventories

Table 3-28 provides anthropogenic emission totals for criteria pollutants for Fremont and Natrona Counties. The emission totals are based on the 2011 NEI, which is a record of historical emissions information reported to the EPA every 3 years by the states (EPA 2015c). Historical emission data from 2014 were not available from the EPA's NEI website at the time of this analysis.

The major emission source categories include area sources (e.g., low-level minor point sources), non-road sources (e.g., construction equipment, off-road RVs), onroad mobile sources (e.g., cars and trucks), and point sources (major sources with elevated stacks).

Table 3-28 and Table 3-29 indicate that the majority of emissions in Fremont and Natrona County are from area sources, which comprise numerous low-level point and other sources associated with oil and natural gas development in the county.

Table 3-28
Criteria Pollutant Inventory for 2011 (tons per year) for Fremont and Natrona Counties, Wyoming

County	Source	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC
Fremont	Area	12,320	1,466	20	36,185	3,914	64,514
	Nonroad Mobile	2,198	323	1	33	31	433
	Onroad	7,186	1,431	6	83	47	713
	Point	2,802	1,049	1,735	250	208	899
Natrona	Area	8,372	1,757	12	20,212	2,229	65,258
	Nonroad Mobile	4,171	332	1	31	29	404
	Onroad	11,198	2,125	9	126	71	1,183
	Point	607	732	298	302	195	808

SOURCE: EPA 2015a

Table 3-29
Hazardous Air Pollutants Inventory for 2011 (tons per year) for Fremont and Natrona Counties, Wyoming

County	Source	Total HAPs
Fremont	Area	12,721
	Nonroad Mobile	104
	Onroad	219
	Point	219
Natrona	Area	8,136
	Nonroad Mobile	92
	Onroad	352
	Point	352

SOURCE: EPA 2015a

WDEQ's overall emissions totals indicate that the majority of gaseous pollutant emissions, especially those of NO_X and VOCs, are from oil and gas development sources. PM emissions are primarily generated by vehicular traffic on paved and unpaved roadways,

Table 3-30 summarizes 2013 emissions for Natrona County from activities and sources associated with oil and gas production and development. These data are from an emissions inventory developed by WDEQ.

Table 3-30
Criteria Pollutant Inventory for 2013 (tons per year)
for Natrona County, Wyoming, Oil and Gas Development Activities

County	Source	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC
Natrona	Completions and Workovers	0	0	0	0	0	0
	Dehydration Unit	–	–	–	–	–	–
	Drill Rigs	0	1	0	0	0	0
	Fugitives	-	-	-	-	-	10
	Heaters	1	2	0	0	0	0
	Pneumatic Pump	–	–	–	–	–	–
	Stationary Engine	–	–	–	–	–	–
	Tanks and Pressurized Vessels	–	–	–	–	–	71
	Truck Loading	–	–	–	–	–	3
Natrona	Venting and Blowdown	–	–	–	–	–	–
	Total	0	0	0	0	0	0

SOURCE: WDEQ 2015b

No data were available for Oil and Gas Activities occurring in Fremont County in 2013.

3.2.1.3.3.2 Carbon Monoxide Monitoring

Carbon monoxide concentration is monitored in Riverton in Fremont County. There are no active CO monitoring sites in Natrona County. Table 3-31 summarizes the CO background concentration data available for this segment.

Table 3-31
Carbon Monoxide Concentrations for Fremont County, Wyoming (2011 to 2013)

Site Name	NAAQS (ppm)	2011 Design Value (ppm)	2012 Design Value (ppm)	2013 Design Value (ppm)	Actual Exceedances
Riverton	1-hour: 35	No Data	No Data	0.6	0
	8-hour: 9	No Data	No Data	0.3	0

SOURCE: EPA 2015b

The 1-hour NAAQS for CO is 35 ppm not to be exceeded more than once per year. The level of the 8-hour NAAQS for CO is 9 ppm not to be exceeded more than once per year. The monitoring data demonstrates compliance with the NAAQS and Freemont County is in attainment for CO.

3.2.1.3.3.3 Ozone Monitoring

Segment 3 is outside the UGRB ozone non-attainment area. Ozone is measured at the South Pass and Casper sites in Fremont and Natrona counties, respectively. Table 3-32 summarizes the ozone background monitoring data available for these sites

Table 3-32
Ozone Concentrations for Fremont and Natrona Counties, Wyoming (2009 to 2014)

County	Site Name	8-hour NAAQS[1] (ppb)	2009 to 2011 Design Value (ppb)	2010 to 2012 Design Value (ppb)	2011 to 2013 Design Value (ppb)	2012 to 2014 Design Value (ppb)	Exceedance Days
Fremont	South Pass	70	72	67	65	64	1 in 2011
Natrona	Casper[1]		61	62	Data Incomplete	58	0

SOURCE: EPA 2015b
NOTE: [1]In October of 2015, the ozone NAAQS was lowered from the 2008 standard of 75 ppb (with the same averaging criteria). The monitoring data shown in this table should be compared against the 2008 standard.

As shown in the table above, the highest values were measured at the South Pass site during the 2009 to 2011 period. Fremont County is currently meeting the ozone NAAQS. Because data recovery at the Natrona County monitoring site has not met minimum data recovery requirements, Natrona County has been classified as "unclassifiable" with respect to the ozone NAAQS.

3.2.1.3.3.4 Particulate Matter Monitoring

PM_{10} concentrations are monitored at the South Pass and Casper sites in Fremont and Natrona counties. Table 3-33 summarizes the PM_{10} concentrations for these sites.

Table 3-33
PM_{10} Concentrations for Fremont and Natrona Counties, Wyoming (2012 - 2014)

County	Site Name	24-hour NAAQS[1] (µg/m³)	2012 (µg/m³)		2013 (µg/m³)		2014 (µg/m³)		Actual Exceedances
			First Maximum	Second Maximum	First Maximum	Second Maximum	First Maximum	Second Maximum	
Fremont	South Pass	150 µg/m³	49	45	34	30	15	11	0
Natrona	Casper		66	54	39	38	30	30	0

SOURCE: EPA 2015a
NOTE: [1]EPA revoked the annual PM_{10} NAAQS in 2006. Wyoming's annual PM_{10} standard of 50 µg/m³ is still in effect.

The PM_{10} 24-hour standard is not to be exceeded more than once per year on average more than 3 years. The Fremont and Natrona County monitors have consistently demonstrated compliance with the PM_{10} NAAQS and both counties are in attainment for PM_{10}.

The Lander SLAM and Casper sites monitors for $PM_{2.5}$ in Fremont and Natrona Counties, respectively. Table 3-34 and Table 3-35 summarize observed ambient $PM_{2.5}$ concentrations for these sites

Table 3-34
Annual $PM_{2.5}$ Concentrations for Fremont and Natrona Counties, Wyoming (2011 to 2013)

County	Site Name	Annual NAAQS (µg/m3)	2011 to 2013 Annual Design (µg/m3)
Fremont	Lander SLAM Site	12 µg/m³	7.8
Natrona	Casper		4.8

SOURCE: EPA 2015b

Table 3-35
24-Hour $PM_{2.5}$ Concentrations for Fremont and Natrona Counties, Wyoming (2011 to 2013)

County	Site Name	24-hour NAAQS (µg/m³)	2011 to 2013 Annual Design (µg/m³)
Fremont	Lander SLAM Site	35 µg/m³	28
Natrona	Casper		14

SOURCE: EPA 2015b

The $PM_{2.5}$ standard of 12 µg/m³ is the annual mean, averaged more than 3 years. The 24-hour $PM_{2.5}$ standard of 35 µg/m³ is the 98th percentile, averaged more than 3 years. Fremont and Natrona Counties are in attainment for the annual and 24 hour $PM_{2.5}$ standards.

3.2.1.3.3.5 Sulfur Dioxide Monitoring

The Casper site monitors ambient SO_2 concentrations in Natrona County. Table 3-36 summarizes the SO_2 design value data for this site. Fremont County does not have an active SO_2 monitoring site.

Table 3-36
Sulfur Dioxide Concentrations for Natrona County, Wyoming (2012 to 2014)

County	Site Name	NAAQS Time Period	NAAQS (ppb)	2011 Design Value (ppb)	2012 to 2014 1-hour Design Value (ppb)
Natrona	Casper	1 hour	75	–	33
		3 hour	500	8	–[1]

SOURCE: EPA 2015b
NOTE: [1]No monitoring data have been reported for the 3-hour secondary SO_2 standard.

The 1-hour NAAQS for SO_2 is 75 ppb calculated as the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour average concentrations. The 3-hour secondary standard is not to be exceeded more than once per year. The Casper SO_2 monitoring site in Natrona County has consistently demonstrated compliance with the NAAQS.

3.2.1.3.3.6 Nitrogen Dioxide Monitoring

Nitrogen dioxide is monitored at South Pass, Casper, and Sinclair/Casper sites in Sublette County. Table 3-37 and Table 3-38 summarize the NO_2 design value data for these sites.

Table 3-37
Nitrogen Dioxide Annual Concentrations for Fremont and Natrona Counties, Wyoming (2011 to 2013)

County	Site Name	Annual NAAQS (ppb)	2011 Design Value	2012 Design Value	2013 Design Value
Fremont	South Pass	53 ppb	1	1	1
Natrona	Casper		–	–	3
Natrona	Sinclair/Casper		–	5	6

SOURCE: EPA 2015b

The annual NAAQS for NO_2 is 53 ppb not to be exceeded during the year. The NO_2 monitoring sites in Fremont and Natrona County have consistently demonstrated compliance with the annual NAAQS.

Table 3-38
Nitrogen Dioxide 1-hour Concentrations for Fremont and Natrona Counties, Wyoming (2011 to 2013)

County	Site Name	1-hour NAAQS (ppb)	2009 to 2011 Design Value (ppb)	2010 to 2012 Design Value (ppb)	2011 to 2013 Design Value (ppb)
Fremont	South Pass	100 ppb	–	–	5
Natrona	Casper		–	–	–
Natrona	Sinclair/Casper		–	–	–

SOURCE: EPA 2015b

Only the South Pass site monitors 1-hour NO_2 concentrations. The hourly NAAQS for NO_2 is 100 ppb based on the 98th percentile value averaged more than 3 consecutive years. The NO_2 monitoring sites in Fremont and Natrona County have consistently demonstrated compliance with the NO_2 1 hour NAAQS.

3.2.1.4 Greenhouse Gas Emissions

3.2.1.4.1 Overview

Gases that trap heat in the atmosphere are called GHGs because they transform the light of the sun into heat, like the glass walls of a greenhouse. GHGs are commonly defined to include water vapor, CO_2, CH_4, nitrous oxides (N_2O), chlorofluorocarbons, hydrofluorocarbons (HFC), perfluorocarbons, and sulfur hexafluoride (SF_6). Without the natural heat trapping effect of GHGs, much of the radiation energy from the sun would be reflected, and the earth's surface would be considerably cooler. However, ongoing scientific research has determined that anthropogenic (man-made) GHG emissions and changes in biological carbon sequestration due to land-management activities are causing more of the sun's energy to be absorbed, thereby affecting the global climate (BLM 2012d). Climate change results from many complex interactions between terrestrial and atmospheric systems and is manifested on a regional and global scale. Although GHG levels have varied for millennia, recent industrialization and burning of fossil carbon sources are suspected to have caused concentrations to increase dramatically and likely contribute to overall global climate changes (BLM 2012d). The Intergovernmental Panel on Climate Change (IPCC) concluded that "warming of the climate systems is unequivocal" and "anthropogenic

drivers, have been detected throughout the climate system and are extremely likely to have been the dominant cause of the observed warming since the mid-20th century." (IPCC 2014)

As with any field of scientific study, there are uncertainties associated with the science of climate change. That does not imply that scientists do not have confidence in many aspects of climate change science. Some aspects of the science are known with virtual certainty because they are based on well-known physical laws and documented trends (EPA 2015f).

Individual GHGs have varying global warming potentials (GWP) and atmospheric lifetimes. GWP is defined as the cumulative radiative forcing effect of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas (EPA 2015e). The reference gas for GWP is CO_2, which is defined to have a GWP of one. Methane's GWP is 21, as CH_4 has a greater global warming effect than CO_2 on a molecule to molecule basis (EPA 2011). GWPs are used to express GHG emissions as a normalized value referred to as carbon dioxide equivalents (CO_2e). Table 3-39 lists atmospheric lifetimes and GWPs for the primary GHGs.

Table 3-39
Global Warming Potentials and Atmospheric Lifetimes of Select Greenhouse Gases

Gaston	Atmospheric Lifetime (years)	Global Warming Potential (100-year time horizon)[1]
CO_2	50 to 200	1
CH_4	12 ±3	21
N_2O	120	310
HFC-23	264	11,700
HFC-134a	14.6	1,300
HFC-152a	1.5	140
Perfluorocarbons: Tetrafluoromethane	50,000	6,500
Perfluorocarbons: Hexafluoroethane	10,000	9,200
SF_6	3,200	23,900

SOURCE: EPA 2011
NOTE: [1]The global warming potential values shown correspond to the IPCC second assessment report (1996). Although a third assessment report was prepared in 2007 with different numbers, per the EPA, 1996 values are to be used to maintain consistency with international practice (EPA 2015f).

Of all GHGs in the atmosphere, water vapor is the most abundant, important, and variable. It is not considered a pollutant; in the atmosphere, it maintains a climate necessary for life. The main source of water vapor is evaporation from the oceans (approximately 85 percent). Other sources include evaporation from other waterbodies, sublimation (change from solid to gas) from ice and snow, and transpiration from plant leaves.

Carbon dioxide is an odorless, colorless gas, which has both natural and anthropogenic sources. Natural sources include decomposition of dead organic matter; respiration of bacteria, animals, and fungus; evaporation from oceans; and volcanic outgassing. Anthropogenic sources of CO_2 include fuel combustion, cement and lime manufacturing, and deforestation. Other activities that produce CO_2 emissions include mineral production, waste combustion, and land-use changes that reduce vegetation.

CH_4 is a flammable gas and is the main component of natural gas. When one molecule of CH_4 is burned in the presence of oxygen, one molecule of CO_2 and two molecules of water are released. A natural source of CH_4 is from the anaerobic decay of organic matter. Geological deposits of CH_4 are known as natural gas fields, and the CH_4 is extracted for fuel. Other sources are landfills, fermentation of manure, and cattle.

Nitrous oxide is produced naturally by microbial processes in soil and water. Anthropogenic sources of N_2O include agricultural sources, industrial processing, fossil fuel-fired power plants, and vehicle emissions. Nitrous oxide also is used as an aerosol spray propellant and in medical applications.

As noted above, other gases that contribute to the greenhouse effect include chlorofluorocarbons, HFC, perfluorocarbons, SF_6. For the purposes of this analysis, however, CO_2, N_2O, and CH_4 are considered the primary anthropogenically generated contributors to global climate change.

In the Project area, most GHG emissions are in the form of CO_2 resulting from the combustion of fossil fuels for oil and gas drilling, oil and gas production operations, and transportation. CH_4 emissions also result from the development of fossil fuel resources, municipal landfills, and agricultural and livestock activities. Several trona mines are also present in Sweetwater County. These mines generate steam and electricity using fossil-fuel fired boilers that produce substantial quantities of GHG emissions.

3.2.1.4.2 Wyoming Greenhouse Gas Emissions Inventories

Affected sources are required to report GHGs every year per EPA's Mandatory Greenhouse Gas Reporting Rule (40 CFR Part 98). The Mandatory Greenhouse Gas Reporting Rule applies to more than 40 industry categories, including stationary fuel combustion sources, electricity generation, petroleum and natural gas systems, petroleum refineries, and many other industries operating in Wyoming. Table 3-40 summarizes the 2013 GHG emissions reported to the EPA.

Table 3-40
2013 Greenhouse Gas Emission in Wyoming

Sector	2013 GHG Emissions (million metric tons CO_2e)	Number of Reporting Facilities
Power Plants	49	16
Petroleum and Natural Gas Systems	9.2	79
Refineries	1.4	6
Chemicals	1.1	4
Other	0.4	2
Waste	0.2	4
Metals	0	0
Minerals	6.4	10
Total Reported:	67.7	121

SOURCE: EPA 2015c
NOTE: Emissions totals displayed at the state level exclude onshore oil and gas production and use of electrical equipment.

The following sections discuss GHG emissions inventories for areas close to each alternative route segment.

3.2.1.4.2.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Segment 1 is in Sublette County. GHG data available for Sublette County is considered representative of the general air quality of Segment 1 and is presented in this section.

Table 3-41 summarizes the GHGs from sources in Sublette County that reported in 2013 for EPA's Mandatory Greenhouse Gas Reporting Rule.

Table 3-41 2013 Greenhouse Gas Emission in Sublette County, Wyoming		
Sector	**2013 GHG Emissions (metric tons CO_2e)**	**Number of Reporting Facilities**
Power Plants	0	0
Petroleum and Natural Gas Systems	538,939	7
Refineries	0	0
Chemicals	0	0
Other	0	0
Waste	0	0
Metals	0	0
Minerals	0	0
Total Reported:	538,939	7
SOURCE: EPA 2015c NOTE: Emissions totals displayed at the state level exclude onshore oil and gas production and use of electrical equipment.		

3.2.1.4.2.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Segment 2 passes through Sublette, Sweetwater and Fremont counties. Most of this segment is in Sweetwater County. The Sweetwater County GHG data characterize Segment 2 for this analysis. The GHG data for Sublette and Fremont counties are presented in Sections 3.2.1.4.2.1 and 3.2.1.4.2.3 of this analysis.

Table 3-42 summarizes the GHGs from sources in Sweetwater County that reported in 2013 in accordance with EPA's Mandatory Greenhouse Gas Reporting Rule.

Table 3-42 2013 Greenhouse Gas Emission in Sweetwater County, Wyoming		
Sector	**2013 GHG Emissions (million metric tons CO_2e)**	**Number of Reporting Facilities**
Power Plants	15	1
Petroleum and Natural Gas Systems	1.5	12
Refineries	0	0
Chemicals	0.1	1
Other	0.4	1
Waste	0	0
Metals	0	0
Minerals	5.4	4
Total Reported:	22.4	19
SOURCE: EPA 2015c NOTE: Emissions totals displayed at the state level exclude onshore oil and gas production and use of electrical equipment.		

The major sources of GHG emissions in Sweetwater County in 2013 were Power Plants, Minerals (trona mines), and Petroleum and Natural Gas Systems.

3.2.1.4.2.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Segment 3 passes through Fremont and Natrona Counties. Emissions inventory data available for both counties is considered representative of the general air quality of Segment 3 and is presented in this section.

Table 3-43 summarizes the GHG emissions from sources in Fremont County that reported in 2013 in accordance with EPA's Mandatory Greenhouse Gas Reporting Rule.

Table 3-43
2013 Greenhouse Gas Emission in Fremont County, Wyoming

Sector	2013 GHG Emissions (metric tons CO_2e)	Number of Reporting Facilities
Power Plants	0	0
Petroleum and Natural Gas Systems	580,807	3
Refineries	0	0
Chemicals	0	0
Other	0	0
Waste	0	0
Metals	0	0
Minerals	0	0
Total Reported:	580,807	3

SOURCE: EPA 2015c
NOTE: Emissions totals displayed at the state level exclude onshore oil and gas production and use of electrical equipment.

Table 3-44 summarizes the GHGs from sources in Natrona County that reported in 2013 in accordance with EPA's Mandatory Greenhouse Gas Reporting Rule.

Table 3-44
2013 Greenhouse Gas Emission in Natrona County, Wyoming

Sector	2013 GHG Emissions (metric tons CO_2e)	Number of Reporting Facilities
Power Plants	0	0
Petroleum and Natural Gas Systems	53,493	2
Refineries	202,199	1
Chemicals	0	0
Other	0	0
Waste	61,813	1
Metals	0	0
Minerals	0	0
Total Reported:	317,505	4

SOURCE: EPA 2015c
NOTE: Emissions totals displayed at the state level exclude onshore oil and gas production and use of electrical equipment.

The industry sectors that emitted GHGs in Natrona County were Refineries, Petroleum and Natural Gas Systems, and Waste.

3.2.2 Cultural Resources

Cultural resources, as broadly defined in BLM Manual 8100, are locations of human activity, occupation, or use identifiable through field inventory (survey), historical documentation, or oral evidence. The term "cultural resources" includes archaeological, historical, or architectural sites, structures, or places and may include definite locations (sites or places) of traditional, cultural or religious importance to specified social and/or cultural groups. They are recognized as fragile and irreplaceable material, places, and things with potential public and scientific uses.

3.2.2.1 Regulatory Framework

Federal agencies must consider the effects of their actions on cultural resources under NEPA and under Section 106 (54 U.S.C. 306108) of NHPA (54 U.S.C. 300101 et seq.). Specifically, Section 106 directs federal agencies to consider the effects of their actions on historic properties and provide the ACHP a reasonable opportunity to comment. The Section 106 process is separate from, but often conducted parallel with, the preparation of an EIS.

Other federal legislation applicable to cultural resources in the Project study area includes:

- The American Antiquities Act of 1906 (54 U.S.C. 320301 et seq.) authorizes federal land-management agencies to manage through a permit process the excavation and/or and removal of archaeological resources on federal lands.
- Archaeological Resources Protection Act of 1979 (54 U.S.C. 302101) authorizes federal land-management agencies to manage through a permit process the excavation and/or removal of archaeological resources on federal lands. These agencies must consult with Native American tribes with interests in resources prior to issuance of permits. In addition, the law sets penalties for the damage or defacement and unpermitted excavation or removal of archaeological resources on federal lands.
- NAGPRA (25 U.S.C. 3001-3002) provides a process through which federal agencies consult with affected Native Americans regarding the treatment and return of human remains, funerary objects, sacred objects, and items of cultural patrimony identified on federal lands.
- Executive Order 13007, issued in 1996 directs federal land-management agencies to accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sites. Where appropriate, agencies shall maintain the confidentiality of sacred sites.
- Executive Order 11593, issued in 1971 directs federal land-management agencies to (1) administer the cultural properties under their control in a spirit of stewardship and trusteeship for future generations; (2) initiate measures necessary to direct their policies, plans, and programs in such a way that federally owned sites, structures, and objects of historical, architectural, or archaeological significance are preserved, restored, and maintained for the inspiration and benefit of the people; and (3) in consultation with the ACHP (54 U.S.C. 304102), institute procedures to assure that federal plans and programs contribute to the preservation and enhancement of non-federally owned sites, structures, and objects of historical, architectural, or archaeological significance.

In addition, the Wyoming SHPO is responsible for ensuring that the Project's effects on lands under the jurisdiction of the state are considered under applicable state laws and that state cultural resources and historic properties laws are followed.

State of Wyoming statutes and guidelines applicable to cultural resources in the Project study area include the following:

- Wyoming Antiquities Act of 1935 (Wyoming State Lands Title 36-1-114-116) requires a permit be obtained from the state to survey, conduct limited testing, or excavate (archaeological data recovery or extensive testing) on any lands owned or controlled by the state.
- Wyoming Environmental Quality Act of 1973 requires the Land Quality Division and the Industrial Siting Division to consider the potential for projects to have adverse environmental impacts, including impacts on archaeological and historic resources.

- Wyoming State Lands Commission Rules, Chapter 3, Section 9 requires that steps shall be taken in the construction and use of easements to protect and preserve archaeological, paleontological, historical, and any other cultural resources on state land.

3.2.2.1.1 Criteria for Listing Historic Properties on the National Register of Historic Places

As stated previously, Section 106 directs federal agencies to consider the effects of their actions on historic properties. Historic properties are cultural resources that are either eligible for or listed in the NRHP. Historic properties must demonstrate importance in American history, architecture, archaeology, engineering, or culture. Per 36 CFR 60.4, properties are considered significant in these categories if they meet one or more of the following criteria:

> (A) are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (B) are associated with the lives of persons significant in our past; or
>
> (C) embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (D) have yielded, or may be likely to yield, information important in prehistory or history.

In addition to demonstrating significance, a historic property must demonstrate integrity, which is based on the following seven aspects: location, setting, design, materials, workmanship, feeling, and association. According to the NPS (1995), these aspects of integrity are defined as follows:

- **Location**. The place where the historic property was constructed or the place where the historic event occurred.
- **Design**. The combination of elements that create the form, plan, space, structure, and style of a property.
- **Setting**. The physical environment of a historic property.
- **Materials**. The physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property.
- **Workmanship**. The physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.
- **Feeling**. A property's expression of the aesthetic or historic sense of a particular period of time.
- **Association**. The direct link between an important historic event or person and a historic property.

3.2.2.2 Cultural Context

To assess the periods of significance for the cultural resources that occur in the Project study area, it is crucial to understand specific themes and events influential in the Region's past. Thus, a cultural context is presented that addresses the chronological and thematic framework for cultural resources that exist in the Project study area. The culture history is divided into two thematic periods: prehistory and history. The following cultural context has been extracted from the Overview of Known Cultural Resources along the RRNP, in Sublette, Sweetwater, Fremont, and Natrona Counties, Wyoming, prepared for the RRNP (Ollie et al. 2016).

3.2.2.2.1 Prehistoric Overview

Human occupation has occurred in the Wyoming Basin for minimally the past 11,500 years. The Project extends across the entire northern portion of the Wyoming Basin physiographic province, bounded to the east by the Northwestern Plains, and to the west by the Wyoming Range. Metcalf (1987) proposed a prehistoric cultural chronology for the Wyoming Basin more than 20 years ago, and while some minor adjustments to the chronology have been offered (McNees et al. 2006, McNees et al. 2010, Thompson and Pastor 1995), it remains the primary structure for discussing changes in prehistoric settlement, subsistence, and technology in the region. Given the proximity to the Northwestern Plains to the east, Frison's (1991) chronology is also applicable as elements of Plains adaptations are relevant to aspects of Wyoming Basin prehistory.

Metcalf's (1987) chronology was specific to the Wyoming Basin, and attempted to frame the Basin's prehistory and elucidate specific traits with less reliance on exogenous temporal frameworks (e.g., Northwestern Plains [Frison 1991], the Northern Colorado Plateau [Holmer 1986], the Columbia Plateau, and the Great Basin). This Wyoming Basin chronology is based on the temporal distribution of 199 radiocarbon-dated components from southwest Wyoming plotted on a smoothed frequency graph. While the method may reflect biases in preservation and research foci through time, it provides a functional framework that can be refined as new data become available (refer to Wheeler et al. 1986, McKibbin et al. 1989, McNees et al. 1994, Thompson and Pastor 1995, Bandy 2008).

The Wyoming Basin chronology includes seven prehistoric phases based on adaptive strategies and technological developments characteristic of Wyoming Basin cultural dynamics (e.g., housepit construction, occupation of stabilized sand dunes, and a faunal subsistence base directed toward pronghorn and small mammals [McNees et al. 2006]).

Prehistoric use of the Wyoming Basin is heavily influenced by the distribution of resources. People traversed the landscape and obtained economic resources in the river valleys, basin interiors, foothills, and mountains as they became available by season, likely overwintering with the aid of stored resources (Binford 1980).

Prehistoric inhabitants accessed various resources in the basin, including widely available lithic resources across the western Project study area and areas to the south, where workable chert and quartzite sources are available. The Yellow Point Ridge Lithic Landscape (48SU1334) is located southeast of the confluence of the Green and New Fork Rivers. Additional lithic sources near the western portion of the Project study area include the Granite Wash Quarry (48SU337) between Granite Wash and Alkali Creek, the Laney Chert Procurement Locale (48SU2892), and the Chalk Butte site (48SU244). Additional widespread lithic sources available to the south of the Project study area include the Washakie Basin (48CR8414/48SW15978); Green River (48SW9516); Hams Fork (48LN3203); Blacks Fork (48LN2469/48SW9241/48UT1582); Shute Creek/Whiskey Basin (48LN2444/48SW10055); and Opal Bench (48LN2426) lithic landscapes. While not overlapping the Project study area, these may have played an important role in prehistoric toolstone use in the vicinity of the Project study area. Known toolstone sources are sparse across the Great Divide Basin, but there are several sources in the eastern portion of the Project study area, in the Rattlesnake Hills vicinity. These include primary deposits mentioned above, in addition to secondary lag deposits of quartzite and chert cobbles.

In addition to lithic resources, seasonally wet playas across the Wyoming Basin appear to have provided favorable intervals for water and plant procurement, as well as locations that attracted animals. Paleoindian game kill and/or processing sites are commonly known for playa settings. Additionally, portions of the western Project study area are situated along major pronghorn migration corridors (McNees et al. 2006), which may have attracted human hunters throughout prehistory and into historic times.

It should be noted that prehistoric populations in the greater region were not restricted to low-lying basin land use. It is clear that high altitude mountain and foothill settings were used throughout the prehistoric and protohistoric. Mountain adaptations began in the Paleoindian Period as recognized most notably by stylistically unique projectile points (Kornfeld et al. 2010: 95–106), as well as evidence for specialized hunting techniques suited for high elevations (Frison et al. 1986). Numerous Paleoindian and Early and Middle Archaic sites have been identified in both open and foothill rock shelters (Frison and Walker 1984, Frison and Walker 2007, Husted and Edgar 2002, Kornfeld et al. 2001); and sizeable high altitude residential village sites have been identified dating to the Late Archaic and Late Prehistoric (Morgan et al. 2012, Stirn 2014). Specialized procurement of high altitude materials is evidenced by obsidian quarrying throughout regional prehistory (Scheiber and Finley 2011); steatite quarrying, which may date as early as the Middle Archaic (Frison 1982:1973); soapstone quarrying in the Late Prehistoric and Protohistoric (Adams 2006); and use of mountain sheep horns in bow manufacturing (Frison 1980). Evidence is also growing with regard to high altitude bighorn sheep trapping (Eakin 2005) and bison hunting (Cannon et al. 2015). The diversity of high altitude land use and site types is continually adding to a growing base of knowledge related to mountain settlement and subsistence patterns and organization of technology (Cannon et al. 2015, Eakin 2005, Finley et al. 2015, Frison and Walker 1984, Kornfeld et al. 2001, Todd 2015). As Todd (2015: 355) notes, high elevation archaeology in Wyoming presents a "record of overwhelming complexity." Acknowledging this fact, the following discussion of culture periods is primarily based on the better understood and more synthetically established data stemming from research on Wyoming Basin populations. Temporal changes in adaptations associated with these groups are discussed in turn below.

3.2.2.2.1.1 Paleoindian Period (ca. 11,500 to 8,500 B.P.).

The Paleoindian Period begins about 11,500 and continues to around 8500 before present (B.P.), when postglacial environmental conditions began to reflect a more modern setting (Metcalf 1987, McKibbin et al. 1989, McNees et al. 1994). This period encompasses the end of the Pleistocene and the beginning of the Holocene, a time that was largely characterized by retreating glaciers and abundant rainfall. Conditions in the Wyoming Basin were wetter than present day and resulted in lush grasslands and savannah-like conditions with substantial precipitation. The increased biomass during this transitional period supported a myriad of herbivores such as mammoth, camel, horse, and extinct forms of bison. As the glaciers retreated and vegetation was re-established, Paleoindian groups spread throughout south-central Wyoming following the movement of large game (Johnson and Pastor 2003:16–18, Thompson and Pastor 1995:21).

The Paleoindian Period is subdivided into Early Paleoindian (11,500 to 10,000 B.P.) and Late Paleoindian (10,000 to 8500 B.P.). Techno-complexes of Early Paleoindians include Clovis, Goshen, and Folsom, while the Late Paleoindian includes Agate Basin, Hell Gap, Alberta, Cody Complex, Frederick, Lusk, Pryor Stemmed, Lovell Constricted, James Allen, and Angostura (Frison 1991, 1992, McNees et al. 2006, Thompson and Pastor 1995). These are primarily defined by patterns of projectile point morphology and manufacturing techniques.

People have occupied the Wyoming Basin since at least the terminal Pleistocene epoch as evidenced by surface Clovis and Folsom projectile point finds. It is assumed that Clovis groups in western North America practiced a high level of residential mobility due to a procurement focus on Pleistocene megafauna like mammoth and bison (Frison 1991, Kelly and Todd 1988). Direct evidence for utilization of other game animals is sparse (Cannon and Meltzer 2004). A flexible and portable toolkit based on bifacial core technology of high-quality toolstone was a hallmark of Paleoindian populations.

The Wyoming Basin region contains sites that yield radiocarbon dates contemporaneous with Paleoindian traditions (McNees et al. 2006, Thompson and Pastor 1995), although many typically lack diagnostic artifacts and contain only limited faunal remains. Evidence of large game hunting, generally viewed as a

signature of Great Plains Paleoindian adaptations, is seemingly absent in the Wyoming Basin region (Thompson and Pastor 1995). Numerous isolated Paleoindian projectile points have been found in the Wyoming Basin, but most localities lack buried contexts containing preserved faunal deposits. This indicates that preservation of buried sites is a biasing factor influencing the paucity of Paleoindian-aged sites in the Wyoming Basin (Thompson and Pastor 1995).

In the greater Wyoming Basin, the Union Pacific Mammoth site (48CR182) yielded a radiocarbon age of 11,280 ± 280 B.P., but lacked diagnostic Clovis artifacts (Irwin 1971). The Pine Springs site (48SW101) yielded late Pleistocene/early Holocene dates (11,830 ± 410 B.P. and 9,695 ± 195 B.P.) and multiple Pleistocene species (e.g., camel, horse, and bison) (Sharrock 1966), but geoarchaeological evidence suggests no association between humans and these fauna (Kelly et al. 2006). The Porter Hollow site (48UT401), dated to 10,090 B.P., contained only a single archaeological feature and a sparse assemblage of lithic artifacts, but no faunal material (Hoefer 1987). The Morgan site (48SW773), Mud Springs site (48SW774), Krmpotich site (48SW9826), and Allen site (48SW13624) all contain Folsom materials (Thompson and Pastor 1995).

In Sublette County, sites 48SU389, 48SU907, 48SU908, 48SU909, and the Second Look site (48SU1565) suggest extensive Paleoindian (e.g., [possible] Goshen, Folsom, Hell Gap, Agate Basin, Scottsbluff, and Cody) occupations. These sites are associated with a playa that likely provided a perennial water source and other attractive resources, as well as a location favorable for archaeological preservation. Diagnostic Paleoindian projectile points from two components around playa site 48SU1421 were tentatively dated between 9000 and 8500 B.P. Another similar playa-tethered Paleoindian site complex in the western Project vicinity includes sites 48SU2662, 48SU3087, and 48SU3090.

Large game procurement remained a facet of later Paleoindian adaptations, but these adaptations are also characterized by more diverse, spatially dependent lithic techno-complexes and a broadening and more diverse range of subsistence options. For the early Holocene epoch, Eckerle and Hobey (1993) posit that Late Paleoindian populations grew in the Green River Basin in response to the onset of warmer, drier conditions. At the same time, a collector adaptation developed, possibly contemporaneous with the Great Plains Cody Complex, in response to an increased need for winter storage of foods. This shift is aligned with what led to the adaptations that characterize the following Archaic Period.

Late Paleoindian components, such as those at 48UT786 (Rood and Pope 1993), 48LN373 (Wheeler et al. 1986), and the Vegan site (48LN1880) (McKern and Creasman 1991), provide evidence of small game utilization and an increased reliance on plant resources. These sites reflect a shift toward a more broad-spectrum hunting and gathering adaptation around 8500 B.P., in the western Wyoming Basin.

The Green River Basin has produced a fairly robust Paleoindian record. While this may reflect past land-use preferences, it is likely also a reflection of oil and gas exploration and the related increase in archaeological surveys. Paleoindian components in the region include Folsom, Goshen, Hell Gap, Scottsbluff, and possible Great Basin stemmed types (McNees et al. 2006). Agate Basin or Agate Basin-like lanceolate projectile points appear to be the most prevalent of the Paleoindian projectile point types found across the Project region (BLM 2003a).

Mountainous areas surrounding the Wyoming Basin contain record of the Late Paleoindian/Foothill-Mountain traditions, which range from approximately 10,000 to 8,000 B.P. Wilfred Husted was the first to suggest a distinction between these co-occurring traditions (Husted 1969, Husted and Edgar 2002:114). Frison also has extensively researched this dichotomy (1976, 1983, 1991, 1992, and 1997). Both suggest that patterned differences in the archaeological data from the two areas represent unique cultural groups or subsistence strategies. This difference appears to have been initiated during the Late Paleoindian Period.

Foothill-Mountain Paleoindians are interpreted as employing a broader, more Archaic-like subsistence base than their Plains counterparts who were focused on bison procurement (Frison 1976, 1997, Willey and Phillips 1958:104–111). Plant gathering took on a higher importance for Foothill-Mountain groups, whereas Late Paleoindians of the Plains maintained a heavier reliance on hunting. Grinding stones found in association with charred seeds, fire pits, storage pits, and parallel-oblique lanceolates in Late Paleoindian deposits at Medicine Lodge Creek are indicative of plant processing during the Foothill-Mountain era (Frison 1976). Grinding stones found at the Betty Greene Site (48NO203) in eastern Wyoming were associated with Plains Late Paleoindian diagnostics (Frison 1991:67), indicating that grinding stones were not unique to the Foothill-Mountain group. The Foothill-Mountain tradition includes various named and unnamed lanceolate projectile points, often with parallel-oblique flaking. A few stemmed projectile points are also associated with this period. Common types include Alder (Davis et al. 1988), Lovell Constricted or fishtail (Husted 1969:12–13), and Pryor Stemmed projectile points (Husted 1969:51–52). Evidence of Foothill-Mountain tradition projectile points is present in basin settings of the Project study area (Burnett et al. 2010), although the mobility patterns (i.e., seasonal rounds) of these groups is not well understood.

3.2.2.2.1.2 Archaic Period (ca. 8,500 to 1,800 B.P.)

The Archaic Period refers to the span of time from about 8,500 to 1,800 B.P. The onset of the Archaic Period in the Wyoming Basin corresponds with an increase in aridity and warmer temperatures, known as the Altithermal (Späth 1989, Thompson and Pastor 1995), followed by the later more mesic Neoglacial conditions (Creasman 1987). Throughout the Archaic Period, the frequency of archaeological site formation increased as a result of more intensive use of the basin by resident populations. The Archaic Period is commonly differentiated from the preceding Paleoindian Period by a decrease in specialized large game hunting as people replaced that specialization with a pattern of broad-spectrum resource exploitation, including broader procurement of medium to small fauna and various plant resources (Thompson and Pastor 1995). The Early Archaic Period is further characterized by the appearance of distinctive house pit structures (McNees et al. 2006).

In their most general form, house pits can be described as semi-subterranean features, with or without a prepared floor, roughly round or oval in plan view and roughly basin-shaped in profile. Most are small and shallow, averaging less than 4.0 meters in diameter and 60 centimeters in depth (Larsen 1997, Yentsch and Rood 2007). Frequently observed are internal fire hearths. Evidence of superstructures or postholes is not frequent, and when they are observed, they lack clear patterning (Larsen 1997, Thompson et al. 1996, Yentsch and Rood 2007). The variation in prehistoric domestic architecture has been explained as reflecting a relationship between the energy invested and the expected amount of time spent in one locality (Larsen 1997, Thompson et al. 1996). A house pit may also be brush covered, but the materials and construction are made for occupancy of several weeks to months (Yentsch and Rood 2007, Thompson et al. 1996). Long-term domestic architecture exhibits greater investment in construction, in anticipation of stays longer than several months or seasons. A pithouse, for example, typically consists of a more circular, deep basin that may or may not have prepared or stabilized (lined) side walls. Interior features, such as prepared floors, prepared and maintained central hearths, storage pits, and other architectural features are important classifiers, as is the presence of middens, as they indicate a longer occupation (Yentsch and Rood 2007, Thompson et al. 1996).

A generalized seasonal round has been defined in southwest Wyoming for the Archaic Period, framed in terms of resource availability and human group size (Thompson and Pastor 1995). Individual ‘residential units’ functioned as the core of each group; groups aggregated and dispersed throughout the cycle in response to resource availability. This basic pattern remained largely unchanged throughout the Archaic.

Archaic groups in the Wyoming Basin appear to have shifted between varieties of ecological settings based on resource availability. In winter, groups occupied camps situated according to the availability and

accessibility of critical resources. These were concentrated in foothill and riparian settings where fuel, game, water, and natural shelter were more abundant. Seasonality is difficult to determine from the Archaic archaeological record at sites across the region, although winter to early spring sites have been identified at the Birch Creek housepits (48SU595), the Trappers Point site (48SU1006), the Taliaferro site (48LN1468) (Smith and Creasman 1988), Maxon Ranch (48SW2590) (Harrell and McKern 1986), and Split Rock Ranch (48FR1484) (Eakin 1987). Small winter camps were likely a more common site type than larger winter villages in the region following the assumption that groups lived off stored food, supplemented by encounter hunting and trapping.

Spring climatic conditions exhibit drastic inter-annual variation. In high-altitude semiarid regions, extreme variability in temperature and precipitation during the early spring affects the availability, abundance, and condition of floral and faunal resources. Furthermore, elevation affects the timing of plant growth, with the earliest growth occurring in the basin interiors. Ethnographic evidence suggests that hunter-gatherer groups often used interior basin areas to procure newly sprouted edible greens and roots (Steward 1938, Shimkin 1947). Plant growth, logically, occurs later throughout the spring with increases in elevation and latitude. As such, spring was a critical time for the archaic hunter-gatherers in the Wyoming Basin. Locating food was of paramount importance, as was the need to replenish other supplies depleted over the course of the winter (e.g., toolstone, bone, wood, etc.).

The Wyoming Basin supported concentrations of critical spring and early summer resources. Roots, such as biscuitroot, wild onion, sego lily, and wild parsley, favor wet meadow or subirrigated floodplain settings. Floodplains of major drainages and tributaries of those drainages appear to have been intensively used by Archaic populations for root procurement during the spring and summer months. Archaeological evidence indicates that intensive root procurement occurred throughout the Archaic and Late Prehistoric periods, although in some areas recent agricultural cultivation has removed much of the archaeological evidence of these procurement activities (Francis 1994).

Another important Archaic resource usually available during the spring and early summer in the Wyoming Basin was pronghorn. During the spring, pronghorn passed along a major migration corridor that led through the Green River Basin. The Trappers Point site is a pronghorn kill site west of Pinedale that provides evidence of large pronghorn kills extending back to the Early Archaic period. Pronghorn were trapped during their seasonal migration. Several other pronghorn procurement and processing sites in the region appear to be associated with migration routes between winter and summer ranges (Miller et al. 1999). Another significant finding from analysis of the Trappers Point faunal assemblage comes from the first, and perhaps only, study to date to address the potential for pronghorn size diminution over time (Adams et al. 1999: 278–289). Certain elements of the Trappers Point pronghorn assemblage were compared to like elements from Protohistoric-aged pronghorn from the Eden-Farson site, located 60 miles south, and a large sample of modern pronghorn and revealed that pronghorn did experience Holocene dwarfing, likely caused by a combination of climate change, human interaction, and animal behavior (Adams et al. 1999: 289).

Access to large pronghorn herds and edible roots allowed archaic populations to aggregate in areas of the Wyoming Basin during the spring and early summer months. Whether or not archaic groups aggregated on a few large sites or a series of smaller residential sites is unknown. In either case, during the summer, residential units appear to have dispersed into small groups in response to spatially diverse resource availability. Also, migrations between summer resource patches are thought to have been more frequent than among winter patches. A variety of subsistence resources would have been available to archaic hunter-gatherers by summer. It is assumed these smaller, dispersed groups engaged in encounter hunting of small and large animals; procurement of birds, reptiles, and amphibians; collection of bird eggs; fishing in mountain streams; and gathering a variety of plant resources throughout all ecological zones.

The importance of elevation to the seasonal round cannot be ignored. Archaic populations exploited resources in higher elevation locales during the summer after the snow melted. In the mountains, roots and other plants would have ripened later than in lower elevations, making a whole new suite of late-season resources available. Unfortunately, there is a paucity of investigations in high elevation settings; thus, archaeological data to support these inferred patterns are scant.

With the autumn season, other food resources became available to Archaic residents of the Wyoming Basin. Berries ripened in the mountains as grass and weedy seeds matured in the mountain basins. In addition, herd animals aggregated for the rut in the late summer and early fall. Human groups might have congregated again into large groups in response to the spatial concentration of critical resources. Specialized task groups might have been organized to acquire other spatially disparate resources with the goal of stockpiling for the winter months.

Early Archaic Period

The Early Archaic, dating between 8500 and 3600 B.P., is divided into the Great Divide phase (8500 to 6000 B.P.) and Opal (Green River) phase (6000 to 3600 B.P.) (Metcalf 1987, Thompson and Pastor 1995). Due to a paucity of sites in the Great Divide phase the first two millennia of the Archaic Period are poorly understood in the Wyoming Basin. The under-representation of the Great Divide phase over much of the region may be due to harsh environmental conditions characteristic of the early to middle Holocene epoch as evidenced by the increase in dune activity and soil calcification during this period (Ahlbrandt et al. 1983, Eckerle 1997, Späth 1989). It was once thought that population densities were extremely low because the area was uninhabitable during this climatic episode, thus resulting in low site frequency (Reeves 1973). However, subsequent interpretations indicate that, as a result of increased aridity and sediment transport, sites dating to the Early Archaic were simply less likely to be preserved (Späth 1989).

The Great Divide phase (8500 to 6000 B.P.) is characterized by side-notched and stemmed projectile points, the use of small mammalian fauna, and the appearance of nondescript "basin features" and housepits (Thompson and Pastor 1995). The frequency of radiocarbon dates throughout the Great Divide phase is low, suggesting small populations or poor archaeological preservation during this time (Byers and Smith 2007, McNees et al. 2006, Thompson and Pastor 1995). In the greater western Wyoming Basin, Great Divide phase cultural remains are evident at 48UT786, dating from 8460 to 8220 B.P. (Rood and Pope 1993); 48CR4492, dated to 8020 B.P. (Creasman et al. 1983); 48LN1185, dated to 8180 B.P. (McDonald 1993); the lower levels at the Deadman Wash site (48SW1455) (Armitage et al. 1982); 48UT1447, dated to 7580 B.P. (Rood and Pope 1993); the Vegan site, dating from 8400 to 7570 B.P. (McKern and Creasman 1991); 48SW6911, dated to 7130 B.P.; and 48UT186, dated to 6740 B.P. (Rood and Pope 1993). Most of these Great Divide phase components consist of dated hearth remains with little associated material culture.

The Great Divide phase is particularly well-represented a few miles north of the Project study area in the Great Divide Basin (McNees et al. 2006), where seven housepit sites have been identified (J. David Love [48SU4479], McKeve Ryka [48SU2094], Jonah's House [48SU2324], the Stud Horse Butte Housepit [48SU3835], 48SU3519, 48SU2317, and 48SU3291) dating between 8240 and 5320 B.P., with most predating 6920 B.P. These represent some of the oldest residential structures in the Wyoming Basin (McNees et al. 2006).

Many of the Early Archaic housepit sites in Fremont and Sublette counties occurred adjacent to streams, Crooks Creek in the case of the Fremont County sites, and Sand Draw in the case of the Sublette County sites. That being said, it has been noted that many Early (and Late) Archaic sites occur in dunes, especially between 8500 and 8000 B.P. and 6000 to 3000 B.P. (Smith and McNees 2005). Dunes can contain water in the form of small playas and interdunal ponds, a trait beneficial to both plants and

animals. Occupations in dunes appeared to be short duration, yet repeated reuse over millennia suggests they were important locations (Smith and McNees 2005).

There is a robust set of well-documented and well-dated sites dating to the Opal phase (6000 to 3600 B.P.) throughout the Wyoming Basin. After 6500 B.P., site densities drastically increase, as do the number of radiocarbon dates obtained from the sites (Thompson and Pastor 1995). These increases may be a function of archaeological preservation, as well as cultural factors such as population increase or changes in settlement and mobility patterns. The Opal phase is characterized by an increase in the frequency of housepit structures and slab-lined basin features; the appearance of large corner-notched and side-notched projectile points, similar to Northern side-notched projectile points; the appearance of large side-notched knives, named the Altithermal Knife (Creasman et al. 1983); an increase in the frequency of ground stone use; reliance on small and medium-sized mammalian resources; and the use of a variety of plant materials (Späth 1989, McNees et al. 2006, Thompson and Pastor 1995). Opal phase housepits are generally large and basin-shaped with subfloor hearths and storage features (Späth 1989, Thompson and Pastor 1995).

Patterns of site density and radiocarbon date frequencies across the Project study area suggest a preferential use of interior rolling plains and upland settings by Opal phase populations rather than the riparian settings. As such, use of these areas might have been facilitated by the onset of moister Neoglacial conditions, permitting groups to expand away from the centralized riverine settings on which they may have focused during the more extreme aridity of the Altithermal.

Middle Archaic Period

The Middle Archaic Period is a Plains designation that is omitted from the Wyoming Basin chronology. It is included here to highlight dominant trends and commonalities between basin and plains occupations during this time period. The Middle Archaic is basically synonymous with the McKean complex, which dates between 5000 and 3000 B.P. on the Northwestern Plains (Kornfeld et al. 2010). As described above, the entirety of the Archaic Period in the Wyoming Basin is characterized by broad-spectrum resource exploitation involving a varied focus on medium to small fauna and plant resources. The most significant difference between the Wyoming Basin and the Northwestern Plains during this time period is the degree to which bison played into the subsistence regime. While the Wyoming Basin saw a continued focus on medium and small game procurement, in addition to a high importance of plant resources, the archaeological record of the Northwestern Plains suggests a significant increase in bison kills, perhaps related to the early stages of the moist Neoglacial period.

Of interest is the presence of McKean projectile points associated with a cobble-lined bell-shaped feature dated between 3900 and 3590 B.P. in the Green River Basin. Based on this find, McNees et al. (2006) hypothesize that other McKean components may be preserved in the region. On the Northwestern Plains, McKean Complex projectile point types are ubiquitous and clearly identified in relation to site type association and age range. In the Great Basin, very similar projectile points from variants of Pinto and Elko series are common, but less defined with regard to association with site types and dates. Further, it is unclear which techno-complex may better define the projectile points from the Wyoming Basin. On the Northwestern Plains, the McKean complex is characterized by a bison-oriented economy. In the Wyoming Basin, bison and pronghorn hunting were supplemented with smaller game and intensive seed processing, as indicated by a drastic increase in ground stone in McKean complex sites (Thompson and Pastor 1995).

Although the 4,500-year-old Scoggin site (48CR304), located outside Rawlins, contains a bison kill (Lobdell 1973, Frison 1991), few other kill sites of this age exist in the Wyoming Basin. Results from this site suggest that even if McKean populations were present, large-scale bison hunting was not a major component of their subsistence (Thompson and Pastor 1995). Another example of bison procurement in

the Project study area comes from the Graham Ranch site (48FR4442), located in the northern Great Divide Basin. This site yielded two components dated between 4350 and 4160 B.P. that contain intensively processed bison remains (Smith et al. 2008). Smith et al. (2008) show that as bison abundance decreases relative to pronghorn availability in the Wyoming Basin (refer to Byers and Smith 2007); intensity of processing individual bison carcasses tends to increase.

Late Archaic Period

The Late Archaic, dated between 3600 and 1800 B.P., is divided into the Pine Springs phase (3600 to 2900 B.P.) and Deadman Wash phase (2900 to 1800 B.P.). The transition from the Early Archaic Period to Late Archaic Period in the Wyoming Basin is defined primarily by a decrease in radiocarbon dates between 4600 and 4300 B.P. The precise cause of this is not known. It could be factors of differential preservation or changes in population density, settlement, and mobility patterns, or some combination of the two (Metcalf 1987). An interesting exception to the reduction in radiocarbon-dated sites is seen in the western Project study area between the Green and Big Sandy Rivers. Here, the Pine Springs phase is represented by more sites than all other prehistoric phases and periods (McNees et al. 2006). However, throughout the region as a whole, Late Archaic Pine Springs phase sites occur in relatively low frequencies.

The transition to the Late Archaic is marked by shifting climatic conditions from the warm, dry conditions typical of the Altithermal to cooler, moister conditions of the Neoglacial (Thompson and Pastor 1995). While no profound change is seen in the subsistence record between the Early and Late Archaic (Thompson and Pastor 1995), Late Archaic archaeological site components generally contain more bison remains, yet still maintain large quantities of pronghorn, rabbit, and other small game. Ground stone use persists during the Late Archaic Period, suggesting a continued plant processing focus.

The Pine Springs phase is characterized by a greater diversity of architectural features, increased intensity in the exploitation of resources in defined settlement ranges, and more complex social organization. This pattern extends into the Deadman Wash phase. Medium to small game and plant resources continue to be exploited (Thompson and Pastor 1995). Some of the more significant Pine Spring phase sites include the Taliaferro site (48LN1468) (Smith and Creasman 1988), Cow Hollow Creek (48LN127) (Schock et al. 1982), Pine Spring (48SW101) (Sharrock 1966), and 48SW1091 (O'Brien 1982).

Deadman Wash phase (2900 to 1800 B.P.) sites occur at lower frequencies than Pine Spring phase sites in the western Wyoming Basin (McNees et al. 2006); although, no clear cause for a corresponding reduction in resident populations exists (Metcalf 1987, Thompson and Pastor 1995). The Deadman Wash phase is characterized by moist climatic Neoglacial conditions, which may have assisted a split in subsistence focus between hunting and collecting activities (Thompson and Pastor 1995). Procurement of bison and pronghorn increased slightly during this phase.

Medium-sized corner-notched projectile points characterize the Deadman Wash phase. In the Great Basin, similar types are recognized as Elko projectile points; however, similar projectile points from the Great Plains are usually designated as Pelican Lake types. Corner-notched Elko series projectile points in the Great Basin are common throughout the Archaic Period, while Pelican Lake types are presently limited to the time span between 3000 and 1500 B.P. Cultural affiliation of Wyoming Basin corner-notched projectile points is problematic given the location of this basin relative to both the Great Basin and the Great Plains. The Applicant recorded more than 350 temporally diagnostic projectile points during 2009 and 2010, more than one-third of which were assigned to the Late Archaic Period. While factors of site preservation may have bearing on these numbers, it seems plausible that this is a clear indicator of increased population use and/or increased use of the basin interior during the period.

In the Wyoming Basin, key archaeological data for Deadman Wash phase sites come from the Porter Hollow Site (48UT401) (Hoefer 1987), the Arthur Site (48SW1023) (Thompson and Pastor 1995), Component III at the Vegan Site (48LN1880) (McKern and Creasman 1991), Component III at the Taliaferro Site (48LN1468) (Smith and Creasman 1988), and Occupation I at the Mayfly Site (48SW6926) (Darlington and Hoefer 1992).

3.2.2.2.1.3 Late Prehistoric Period (ca. 1,800 to 300 B.P.)

The Late Prehistoric Period in the Wyoming Basin is dated between 1800 and 300 B.P. and is segregated into the Uinta phase (1800 to 900 B.P.) and the Firehole phase (900 to 300 B.P). While aspects of shifts in settlement and subsistence patterns play into the designation of a separate period, the most salient key trait marking the beginning of this period is the introduction of bow and arrow technology. Otherwise, the basic patterns of seasonal land-use and broad-spectrum hunting and gathering stay fairly consistent. That being the case, there is a notable spike in the number of radiocarbon-dated components. The coincidence of this trait with the introduction of bow and arrow technology and an increase in ceramics cannot be overlooked (Metcalf 1987, McNees et al. 2006, Thompson and Pastor 1995). Environmental and technological changes usher in heightened exploitation of seeds, pronghorn procurement, and increased numbers of bison kills. Two of the region's most notable large-scale pronghorn kill/processing sites are the Eden-Farson (48SW304) site and the Boars Tusk (48SW1373) site (Green River Basin).

While there is a dramatic rise in the number of sites dating to the Uinta phase, it is unclear how this relates to actual population increase (Byers and Smith 2007) versus factors of archaeological site preservation and visibility (e.g., Surovell and Brantingham 2007). During the Firehole phase (1000 to 300 B.P.); however, the number of dated components drops drastically across the region.

If there was indeed an increase in human populations in the Wyoming Basin during the Late Prehistoric Period, it may have ushered in significant changes to resident group size and mobility. First, population increase likely restricted seasonal rounds compared to that experienced by earlier groups, which would have likely caused constricted access to resources (e.g., Byers and Smith 2007) and a concomitant shift toward more intensive resource exploitation. This may have necessitated more frequent residential moves by groups within previously established ranges as local resources were depleted. Furthermore, as home ranges decreased, long-distance interaction and exchange systems were probably more appealing to facilitate access to a wider array of resources.

As a result of increased territoriality, it has been postulated that groups may have employed seed broadcasting and manipulation of plant species around campsites, possibly demonstrating the first evidence of artificial husbanding of vegetal resources in the area (Smith and Creasman 1988). Furthermore, bison hunting appears to have intensified as seen at Late Prehistoric bison kills including Bessie Bottom (48UT1186) (McKern 1988), Woodruff (42RI1) (Shields 1978), Barnes (48LN350) (Thompson and Pastor 1995), and most notably, Wardell (48SU301) (Frison 1973, 1991, Drucker 2006). Wardell represents Avonlea people who originated in Canada and made their way south through Montana and Wyoming and on to the southwest. Coordinated bison drives and traps, such as Wardell, demonstrate a high degree of cohesive community organization likely reflecting several different groups working in a coordinated fashion. This further implies that numerous bands of Avonlea people likely inhabited the UGRB. Except for the Paleoindian Finley and Archaic Scoggins sites, most bison kills in western Wyoming date to the Uinta phase (Smith et al. 2008).

The Uinta phase may have been a time of increased inter-group tension and stress as a result of increased population density, increased territoriality, the introduction of new weaponry (e.g., the bow and arrow), regional faunal resource depression (Byers and Smith 2007), and possible incursions of foreign groups from the Eastern Woodlands, Northern Plains, Great Basin, and northern Colorado Plateau into the Wyoming Basin. This assumption is supported by evidence of violence at several human burial sites,

including the Robbers Gulch (48CR3595), Bairoil (48SW7101), and Deer Butte burials (48SW10878) (Gill 1991).

The archaeological record suggests that Fremont populations entered southwest Wyoming during the Uinta phase (Thompson and Pastor 1995). This assumption is supported by the presence of calcite-tempered pottery, distinct rock art styles, manos and metates, disk beads, and farmsteads and granaries (Metcalf 1987), all of which are indicative of the introduction of exogenous Fremont populations into the region. The exact nature and extent of the interaction between Uinta phase and Fremont groups is unknown (Thompson and Pastor 1995).

According to Thompson and Pastor (1995), Uinta phase sites typically contain Rosegate projectile points, Desert and Uinta side-notched projectile points, and small, triangular, corner-notched projectile points. Specialized hearths are also present, interpreted as vegetal/seed processing features. Pottery is present and is interpreted to be most typically of local manufacture. Intermountain Ware ceramics were recovered at 48SU1443, and brown-gray pottery sherds with sand tempering from the site show a distinct similarity to ceramics from the nearby Wardell bison kill site.

During the subsequent Firehole phase, the paucity of cultural components does not appear to be the result of abandonment of the Wyoming Basin, but rather that populations decreased in response to climatic changes associated with the Medieval Warm Period (roughly 900 to 500 B.P.), prior to the Little Ice Age (Thompson and Pastor 1995). During this interval, marginal arid environments were unsuitable to support the higher human population densities experienced during the previous phase.

Firehole phase sites are characterized by Tri-notched, Desert Side-notched, and Cottonwood Triangular projectile points (Thompson and Pastor 1995). Pottery assemblages are diverse and include Intermountain Ware pottery; steatite vessels also appear during this period (Adams 1992). These artifact types are often attributed to Shoshone populations. However, the timing of the arrival of Numic groups, such as the Shoshone, into western Wyoming is unclear. Therefore, it is unknown if the transition from the Uinta to Firehole phase represents the arrival of Shoshone populations or the result of more complex ecological and cultural dynamics (Thompson and Pastor 1995).

Key Firehole phase sites in the Wyoming Basin include the Cow Hollow Creek (48LN127) (Schock et al. 1982), Skull Point (48LN317) (McGuire 1977), Archery Site (48SW5222) (Hakiel et al. 1987), South Baxter Brush Shelter (48SW5176) (Hoefer et al. 1992), and Eden-Farson (Frison 1971, 1991). Bird Canyon (48SU390) contains an archaeologically rich Firehole phase campsite component with bone and antler implements, the remains of big horn sheep, and ceramics (McNees et al. 2006).

Stone circle sites, many of which may date to the Late Prehistoric Period, are known across the Wyoming Basin. There are a variety of uses and a range of morphologies for these features. Some may be the remains of dwellings (tipi rings), while others may have served spiritual purposes. The flanks and bluffs of the Green River uplands have produced numerous stone circle sites, rock alignments, rock cairns, and other (presumably) Late Prehistoric stone archaeological sites. It is possible that these are representative of complex hunting strategies (drive lines, game observation points, blinds) involving prehistoric manipulation of game. Many of these features and sites are traditionally considered sensitive and are respected areas for modern-day Native American tribes.

3.2.2.2.1.4 Protohistoric Period (A.D. 1600 to 1800).

The Protohistoric Period in the region lacks concise beginning and ending dates. It likely began sometime in the late seventeenth or early eighteenth century when native groups in the region became aware of colonizing European empires through acquisition of European-derived trade goods and livestock. Contact with these goods and animals, as well as epidemic diseases from Europe (Ramenofsky 1987, Dobyns

1993), almost certainly preceded direct contact with Europeans in the Project region. The end of the Protohistoric Period is roughly coincident with the beginnings of the fur trade era, which is marked by the beginning of annual rendezvous and slightly later the establishment of permanent trading posts which resulted in a relatively permanent Euro-American presence.

Introduction of horses and trade goods such as glass trade beads, in all likelihood, preceded direct contact with Europeans by many decades. An articulated horse skeleton found at 48SW8319 in the Bridger Basin near Flaming Gorge Reservoir produced radiocarbon dates which indicate this animal may date to the seventeenth century (Eckles et al. 1994), although these dates are difficult to interpret given the calibration curve plateaus and reversals during this time. This animal was found with extreme hack marks and placed with three coyote skulls, which may indicate a treatment similar to early accounts from the DeSoto expedition (1540 to 1542) where horses were initially killed because of association with the Spanish (Haines 1938:114). Elsewhere, on the eastern side of the Bighorn Mountains, the campsite area at the Big Goose Creek (48SH313) site yielded an iron awl and brass arrow point (Frison et al. 1978). Radiocarbon dates from the site calibrate into the sixteenth and seventeenth centuries; however, it is not clear if the trade goods are associated with the dated components. Based on the pottery, this site is associated with the Crow and provides evidence of their early western expansion from the Middle Missouri Region.

Based on the historical accounts, Haines (1938) presented a model of the northward dispersal of horses and acquisition by native groups that is still the basis for understanding the development of equestrianism in western North America (Roe 1955). Horses became available in the south after the establishment of stock raising centers around Santa Fe, and particularly after the Pueblo Revolt of 1680 drove out the Spanish colonists, large numbers of animals became available. Equine species were disseminated north by various means (e.g., trading and raiding). Later, Ewers (1955:11) describes a horse trading locus in the Wyoming Basin of Wyoming, through which horses from the south were funneled to the Shoshone and traded to northern and western groups such as the Crow and Nez Perce. The actual route by which the horses moved is hypothetical. This could be Comanche or Ute funneling horses to the Shoshone or possibly Crow. Hämäläinen (1998) postulates a trading center of the Comanche on the Arkansas River in the Big Timbers region whereby Southern Plains goods were traded to Central and Northern Plains groups and vice versa. Based on this model, Native American tribes north of the Southern Plains and in the adjacent Rocky Mountain regions would have likely obtained horses by the early 1700s.

In the winter of 1787 to 1788 while wintering with the Piegan in the foothills of the Northern Rockies, Thompson (1916:328–334) is told by an adopted aged Cree named Saukamapee, whom he estimates to be 75 to 80 years old, of battles in the 1730s against mounted Eastern Shoshone groups being the first contact the Piegan, and other northern groups, had with horses. These animals were initially property of Shoshone groups who it is thought gained early access to horses through their Comanche brethren, who at the beginning of the eighteenth century began to acquire equine herds on the Southern Plains. This access allowed the Shoshone to expand their territory in the eighteenth century. This expansion was relatively short lived as groups to the north and east such as the Blackfoot and Lakota began acquiring guns, which effectively trumped the advantage equestrian Shoshonean groups maintained by the beginning of the nineteenth century (Secoy 1953). This Shoshonean expansion may be marked by the appearance of tri-notched projectile points, which for example are found in the upper kill level at the Glenrock Buffalo Jump (48CO304), which postdates the fifteenth century (Frison 1970, Newton 2011:59). The River Bend Site (48NA202) on the North Platte River just west of Casper is a seventeenth or eighteenth century Shoshone occupation containing iron fragments and a single horse cranium indicative of early and limited access to trade goods which characterizes this period (Buff 1983, McKee 1988).

Little historical evidence exists of contact with Europeans by Native American tribes in the region. Beginning in the eighteenth century, it is likely that European traders were impinging on the region. It is

clear that native groups were beginning to make sporadic contact with European traders in the eighteenth century. Cheyenne tradition indicates that traders from places such as Santa Fe and Taos, New Mexico, were coming as far north as the Bighorn Mountains in the eighteenth century to exchange iron for bison products (Branch 1997:21). In 1742 to 1743, the Vérendrye brothers met native people in the Northern Plains who spoke Spanish (Nasitir 2002:33–34), and Jacque D'Eglise, who was the first documented Spaniard to visit the Mandan villages beginning in 1790, saw "saddles and bridles in Mexican style" (Nasatir 2002:161, Nasatir 1927:49).

This trade and the effects it had on native groups in the Project region fall largely outside of historical documentation, as this area was basically insulated from sustained direct economic and physical contact by native groups in the intervening areas who acted as middlemen and even discouraged direct access to European trading centers. Such is the case in the Wyoming Basin where acquisition of British, French, and/or Spanish goods primarily was through indirect trade with native middlemen such as the Lakota or Cheyenne, who, for example, were located between the Shoshone and the Middle Missouri village trading centers (Jablow 1950). However, the trading acquisition models vary and other types of trade, which relied on ethnic ties were carried out. In an account from 1805, François-Antoine Larocque describes this relationship based on an encounter with a Shoshone group near the Bighorn Mountains (Wood and Thiessen 1985). This account describes the value placed on glass trade beads as well as the various means by which goods were acquired. Larocque states "a few of those blue Glass Beads they have from the Spaniard, and on which they set such value that a horse is given for 100 grains" and that these beads are acquired "by the second and third han[d]" (Wood and Thiessen 1985:192, 217). Larocque later encounters a Shoshone who "had been absent since the spring and had seen part of his nation [Comanche?] who trade with the Spaniards; he brought a Spanish B[r]idle and Battle ax, a large thick blanket, striped white and black and a few other articles, such as Beads &c." (Wood and Thiessen 1985:189).

The profound effects of European-derived materials and technologies, particularly horses and metal, on native societies and economies is understood in a nominal or first-order sense. However, how specific Native American tribes occupying the Project study area were particularly affected by these processes is not entirely clear.

The archaeological record of this period is elusive given its relatively short duration and light footprint compared to the archaeological record of the Prehistoric and Historic periods. Furthermore, the material culture from this period is largely homogenous and lacking in diagnostic attributes, which is compounded with the issues in radiocarbon calibration after the fifteenth century. Unequivocal evidence of a Protohistoric occupation is difficult to discern given that the most prominent and widespread trade goods, such as glass beads, changed little up even into the later Historic period. Differentiating the Protohistoric archaeological record may require directed research and particular methodologies including metal detecting. It is also important to recognize that Protohistoric Period sites may not contain European trade goods and can differ little assemblage-wise from prehistoric sites, which appears to be the case at 48SW2590 and 48FR1419 where dated Protohistoric components contained no European trade goods (Martin 1999, Pool and Graham 2005).

3.2.2.2.2 Historic Overview

The advent of what can be considered the Historic period begins in earnest with the introduction of the fur trade economy in the region. Trade in animal skins in North America was the impetus behind some of the earliest native European interactions. In the Wyoming Basin, Spanish trappers venturing out of Santa Fe and Taos likely carried out intermittent trapping and trading ventures, but direct accounts of these interactions are not recorded (Branch 1997). However, the influx of Europeans and establishment of permanent or semi-permanent trading centers was not noted until the early nineteenth century (Wishart 1992).

Following the establishment of Fort Astoria along the Columbia River in 1811, which included a western overland journey by a party of trappers and traders led by Wilson Price Hunt that passed through northern Wyoming (Irving 2004a), a European-American party led by Robert Stuart returned east overland through the Wyoming Basin. The passage of Stuart's group through South Pass is the first documented non-indigenous use of the travel route (Rollins 1995). Stuart, while on the left fork of Pocket Creek in October 1812, met a group of Shoshone and traded "a Pistol, a Breechclout an axe, a Knife a tin Cup, two Awls and a few Beads they gave us the only Horse they had and for a few trinkets we got Buffalo meat and leather for mogasins, an article we much want" (Rollins 1995: 161).

The Astorian expedition is generally viewed as the event that ushered in the western fur trade; but even prior to this, trade was established on the upper Yellowstone River beginning with the post Manuel Lisa built in 1807 (Douglas 1964). In 1824 the fur trade came directly to the Wyoming Basin with the establishment of annual trapping rendezvous initially developed by William Ashley, who first brought a brigade of company trappers to the region (Dale 1991). The system developed by Ashley eschewed permanent trading posts for annual meetings where goods where brought to trappers working in the Rocky Mountain region. The Rocky Mountain Trapping System as characterized by Wishart (1992) consisted of both "company" and "free" trappers pursuing beaver, and to a lesser degree other furbearing animals, in the Central and Southern Rocky Mountains, which were traded for goods at an annual rendezvous with vendors that included St. Louis companies and even occasional representatives from Hudson's Bay Company (Topham 2007). Noted mountain men and traders, including the Sublette brothers, Jedediah Smith, Jim Bridger, Thomas Fitzpatrick, Robert Campbell, and Nathaniel Wyeth, attended these events (DeVoto 1947, McNees et al. 2006, Morgan and Harris 1987).

These rendezvous, which also attracted Indian groups, were held in the Wind River, Green River, or Snake River basins and lasted from 1824 to 1840. Rendezvous took place in the UGRB in 1833, 1835 to 1837, and 1839 to 1840 (Friedman 1988, McNees et al. 2006). A multitude of factors, including falling beaver prices and overhunting, ultimately spelled the demise of this system (Wishart 1992: 198). By the early 1830s, permanent posts (albeit many short-lived) had been established in the Central and Southern Rocky Mountains, including Fort Davy Crockett (1837 to ca. 1841) along the Green River in Brown's Park, and several at the confluence of the Laramie and North Platte Rivers, most notably Fort William established by William Sublette in 1834 (Eddy 1982, Robertson 1999). Captain Benjamin Bonneville brought wagons west to the Green River Rendezvous in 1832 and established an overwintering post known as Fort Bonneville in the western Wyoming Basin of Wyoming (Irving 2004b). This was the first wagon train brought through South Pass, which would later be used by westering Euro-American settlers.

The fur trade era in the region initiated an era of direct contact between tribes and Euro-Americans in the region. Trade with tribes, such as the Shoshone, Crow, and Arapaho, was integrated into the fur trade economy with tribes providing items such as bison robes and horses to the traders. As the beaver-based fur trade economy waned, trade in bison robes and other goods acquired from tribes became more prevalent, particularly on the western Great Plains (Newton 2012). In the UGRB, which saw a large amount of fur trade activity, the era is commemorated at the Green River Rendezvous National Monument (48SU52) and the Trappers Point Site (48SU411) located at the confluence of Horse Creek and the Green River (McNees et al. 2006).

In the late 1830s, economic difficulties, including the Panic of 1837 (McGrane 1924), led many in the eastern and mid-western U.S. to seek new opportunities in the Oregon and California territories. By the 1840s, emigrants followed wagon routes traversed in 1836 by the Whitman-Spaulding evangelistic mission and pioneered new routes as well (DeVoto 1947). Later, the discovery of gold in California in 1849 spurred this emigration. The main routes to the west pass through the Green River Valley, which was traveled by tens of thousands of Euro-American settlers. The main travel corridor on which colocated trails used by emigrants travelling to California, Oregon, and Utah crosses through the Wyoming Basin,

and beginning in the 1840s, existing infrastructure, such as Fort William or Fort John (1834 to 1849), and especially Fort Bridger (1842 to 1857) located in southwest Wyoming, was economically dependent on these travelers (Robertson 1999). Both of these posts figure prominently in the later history of the region as both became U.S. military posts with personnel involved in the Plains Indian wars (1860s to 1870s) and the campaign against the Mormons (1857 to 1858). Fort William became known as Fort Laramie after purchase by the military in 1849 and Fort Bridger became a military post in 1857, both lasting until 1890 (Robertson 1999). The Wyoming Basin, following the fur trade era and up into the later nineteenth century, can be characterized by the prominent travel corridors used by American settlers.

From the 1840s through the 1860s, the east/west emigrant trail system was heavily used, and it produced the first clear evidence of historic use in the Project study area. These trails include the Oregon NHT (1843 to 1868), the California NHT (1841 to 1868), and the Mormon Pioneer NHT (beginning 1847), as well as variations or "cutoffs" such as the Sublette Cutoff of the California NHT (1844 to 1868).

The Sublette Cutoff of the California NHT (48SW1841) became the popular route after 1844, particularly by California-bound emigrants (Larson 1978:9). This cutoff departs from the main route at the Parting of the Ways (48SW4198), shortening travel distances by approximately 50 miles by crossing the waterless, rugged Little Colorado Desert. The Parting of the Ways is 4 miles north of the Project study area. Despite being more prominently known for Oregon-bound emigrants, 9 out of 10 settlers using the Sublette Cutoff of the California NHT were in fact bound for California or Utah (Larson 1978:9). In 1860 to 1861 the trail was used by the Pony Express NHT. During this time, the Bridger Trail (48NA207) was established by Jim Bridger in 1864 as an alternative route to the Bozeman Trail, which followed a route north to the Montana gold fields through the eastern Bighorn Basin (Gray 1977). The Bridger Trail crosses the northern portion of the Project study area.

During this era, military expeditions (following the emigrant trails) explored, surveyed, and gathered information for the U.S. Government about the western portion of the continent. One portion of the Oregon/California/Mormon NHTs is designated a military route due to its use during these expeditions. The first of these forays into the Project region were the Fremont expeditions of 1842 to 1843 that, guided by Kit Carson, surveyed the early emigrant corridors (Jackson and Spence 1970). In 1849 and 1853, respectively, the Stansbury and Simpson expeditions traveled the emigrant trails to the Salt Lake territory, and were followed in 1857 by Alexander's Utah Expedition for the so-called Mormon War. By 1857 Frederick Lander began road surveys across the Upper Wyoming Basin (north of the Project study area) in development of what would be known commonly as the Lander Cutoff of the California NHT, an alternate route on the early emigrant rail system (BLM and USFS 1998). The Lander Cutoff of the California NHT, as well as other trail variants, received later use as stage and express routes until the coming of the railroad, after which most stage and supply wagons ran regionally to and from the railroad arteries. Emigrant travel on the Lander Cutoff of the California NHT dropped during the 1860s after the Transcontinental Railroad (Union Pacific mainline) was constructed.

Congress authorized the building of the Transcontinental Railroad in 1862, during the middle of the Civil War. The Homestead Act of 1862 followed soon after. Increasing traffic on the emigrant trails and the need of the U.S. to protect its western citizens and maintain territories, led to the establishment of military forts in the region (although outside of the Project study area). The Reservation system was established with policy first executed in (what is now) Wyoming with the 1851 Treaty of Fort Laramie (Larson 1978). The Wind River Reservation was established for the Eastern Shoshone in 1868 under the Treaty of Fort Bridger; the Northern Arapaho were received there in 1877 (Larson 1978).

In 1868 Wyoming became an official U.S. Territory, following the Transcontinental Railroad's opening of the region to settlement (Larson 1978:64). European-American settlement in the Wyoming Basin beginning in 1870s was accompanied by the development of transportation infrastructure between towns,

railheads, and outlying agrarian communities. Particularly in the Project study area, wagon roads are prominent as the movement of people and goods through the largely environmentally marginal Project study area to more agriculturally viable settings in the region. These include the Bryan-South Pass Road (48SW3869), which began in the late 1860s as a stage road from the Union Pacific Railroad (Johnson 1998). By the 1880s, several wagon roads were in use throughout the Project study area including the Waltman to Sweetwater Road (48FR2623), the Rawlins to Fort Washakie Road (48FR415), the Green River to South Pass Road (48SW3864), the Casper to Lander Road (48FR1783, 48NA4218), and the Rock Springs to Lander Road (48SW4163), which began use in 1894 (Gardner 1982). Many of these roads were stagecoach routes and had stage stations associated with them such as the Crooks Gap Stage Station (48FR1435) located along the Rawlins to Fort Washakie Road (48FR415) and the Bird Stage Station (48SU1715) established in 1890s along the Opal Wagon Road (48SU852). The Opal Wagon Road, which began use in 1882, was an important freight/stage wagon route between the shipping railhead in Opal to the upper Green River Valley that saw use until circa 1924 when construction of the U.S. 189 auto route was completed (Rosenberg 1985).

Around this time gold was discovered in the area around South Pass City initiating a gold rush that brought thousands of people into the area. After decades of rumors and some limited success prospecting in the area, it was not until a party of prospectors led by Lewis Robinson returned to Salt Lake City in 1867 with a substantial amount of gold they had removed from ore in a short period of time that the South Pass area was rushed by fortune seekers (Bagley 2015). Although there were earlier claims in the area and even the organization of a nearby mining district, what came to be known as the Carissa Lode discovered by Robinson and his partners catalyzed the development and Euro-American population of the South Pass area. The fear of Indian attacks that kept most away in the preceding decades was forgotten in the rush to stake claims.

Soon the fully equipped mining town of South Pass City (48FR434) was established near the Carissa Lode, as were the nearby towns of Atlantic City (48FR711) and Miner's Delight (48FR435), which were associated with other gold deposits. Accounts indicate that there may have been as many as 2,000 people living in the area in the summer of 1868 and an 1869 summer census showed 1,517 in the mining area followed by a regular census of 1870 that showed a population of 1,166 (Larson 1978: 113). By 1872 the three towns probably each had populations of less than 100, and the dwindling population reflects the lack of success most had in the area (Bagley 2015). The South Pass gold rush was small and relatively short-lived compared to those in places such as Colorado and California with most mining ceased by 1873. The size of the gold is a direct reflection of the overall lack of gold deposits in the South Pass area and a twentieth century study indicates no more than $2,000,000 in gold was recovered from the mines from 1867 to 1873 (Larson 1978: 113).

Although short-lived, the South Pass gold rush, during its heyday, did bring considerable amounts of people into this territory and result in a permanent population base. Given the threat of Indian hostilities, this population was provided military protection and in 1870 Camp Stambaugh (48FR436) was established near the South Pass mining towns (Miller 2012: 113). The camp was strategically located near the South Pass mining communities and the Oregon, California, and Mormon Pioneer NHTs that used South Pass. The camp was named after Lieutenant Charles Stambaugh who was killed in a battle with some Arapahos near Miner's Delight earlier that year. The post had a 156-man garrison and a post office but a rather uneventful history compared to the ongoing military actions elsewhere in the region. Camp Stambaugh was abandoned in 1878 (Miller 2012: 113).

Much like Camp Stambaugh, Camp Augur (48FR718) was established as a subpost of Fort Bridger along the Popo Agie River in 1869 to protect peaceful Shoshone on the Wind River Reservation, as well as the mining population in the region (McDermott 1993). It was reorganized as a separate post in 1870 and renamed Camp Brown in honor of Captain Frederick Brown who was killed in the Fetterman Battle

(Miller 2012:112). In 1871 the camp was relocated to the Little Wind River on the reservation where it remained and was renamed Fort Washakie (48FR430) in 1878. Fort Washakie eventually became the location of a settlement and center of commerce as it was connected to the Union Pacific Railroad via the Rawlins to Fort Washakie Road. It was turned over to the Department of Interior in 1909 and became the headquarters for the Shoshoni Agency (Frazer 1972).

Regional cattle ranching essentially began with Fort Bridger in 1843, when Jim Bridger bought trail-weary stock from those passing on the early emigrant trails, grazed them back to better condition on a bounty of native grasses, and sold them at a profit to other emigrants (Rosenberg 1984). Aridity is a major reason why open range livestock ranching was the primary industry of permanent settlement in the Upper Wyoming Basin. Although dryland farming had resurged in many areas of the West by the early twentieth century, conditions of altitude and length of growing season meant this type of agriculture was largely unsuccessful in this region. The Homestead Act of 1862 and its successors, which allowed cattlemen to homestead a base ranch and pastures in prime bottomland and at water sources, aided the open range livestock ranching system. As with much of the West, area ranches tended toward consolidation into large ranches as a more sustainable way to maintain profitable herd sizes. Historical ranching in the UGRB began in 1872, when John "Sheep" Smith began a sheep operation near the mouth of Fontenelle Creek; by 1873 Roney and Alfred Pomeroy also established a cattle outfit at the mouth of Fontenelle Creek (BLM 1987).

Early Wyoming ranchers perpetuated the system of open range livestock ranching, imported from the former Mexican territories of the Southwest and Texas. When ranching was initiated in the territory, cattle were generally grazed on surrounding public lands, ranging to surrounding mountains in the summers and to lowland basins in the winters. The open-range system faded after disastrous winters in the late 1880s that resulted in the decimation of cattle herds; coincident to this catastrophe the cattle market also plummeted, bursting a bubble of market speculation that was largely fueled by foreign and other non-local investors. When many Wyoming ranches went bust after the killing winters and market fall, small ranchers were again able to viably build independent holdings. By the 1890s, still recovering from the season of terrible winter die-offs and market collapse, cattlemen began to more widely feed their cattle through the winters, to keep them strong and to keep them from wandering too dispersedly. Ranchers accomplished this by pasturing cattle and cultivating grass hay in their bottomland holdings. This management of the range and ever-increasing population around established settlements led to both private and government fencing of the lands.

In many areas of Wyoming, cattle ranching originally had been established to the exclusion of any sheep herding operations. The earliest sheep herding in the Wyoming region was more focused on the mutton market, in direct competition with beef cattle, than on wool production. Because cattle were available from cheap sources in the late 1860s and were worth much more per head than sheep, it was probably more profitable to be a cattle rancher as Wyoming Territory was settled. But, by the 1890s, most sheep ranching had reoriented toward wool production. By 1907 the University of Wyoming had a wool technology department, led by John Arthur Hill, influencing the study of wool production and processing through the 1940s (Field and Kercher n.d.), when synthetic fibers began to displace wool. Sheep camps can be found throughout the Project study area, and were operated up into the second half of the twentieth century.

Range management practices, violent rancher conflicts, and public land abuses all contributed to the reservation of public lands and minerals for management purposes when it became clear that initial extractive and settlement approaches were negatively affecting broad areas of western lands. In 1895 U.S. forestlands were withdrawn into Forest Reserves. However, federal legislation was still maintained to encourage the growth of individual family agricultural holdings. Forestlands were then placed under USFS management in 1905 and the first division of (summer) grazing rights into a permitted allotment

system was developed. The USFS also dictated which allotments could be used for sheep herding and which were meant for cattle herding, which were types of herding often known to come into physical conflict in the region.

Reflecting the range permitting system in the Upper Wyoming Basin and seasonal grazing restrictions, historic homesteads or ranches can be found throughout the Project study area including the Bailey Homestead (48SU941), the Mills Homestead (48SU1277), and the Morton Ranch (48NA1090). These sites date from the 1910s into the 1940s and both home ranches and associated line camps were used by ranchers as they moved their livestock to and from winter range, a process known as the Green River Drift (McNees et al. 2006). These sites contain log structures and water management features, like wells, windmills, and stock ponds. Elsewhere, the Project study area has witnessed energy development particularly extractive activities since the early 1900s, as demonstrated by the historic 1920s to 1930s oil camp (48SU1206) recorded on Birch Creek.

The Project study area, being notably arid, is largely used as winter rangelands. In 1934 the Taylor Grazing Act completed the reservation of these desert and other remaining non-forest lands, which were held federally by the GLO. GLO lands were also divided into grazing allotments with restricted range access, managed by the National Grazing Service, which was formed pursuant to the Taylor Grazing Act as well (Merchant 1993:321). Depression-era federal relief programs, like the New Deal's Civilian Conservation Corps and the Soil Conservation Service, were also established in the 1930s to perform range improvement projects and wilderness access projects, heralding a new era of progress for range and forest management practices. In 1935 the National Soil Conservation Service was founded (but has since been renamed as the NRCS) and began work to assist ranch owners with range development projects like water catchments and erosion control measures. After its inception in 1946, the BLM (formed through federal merger of the GLO and the Grazing Service) also began building stock tanks, water wells and pipelines, and stock ponds on its desert lands to serve the cattle industry and wildlife.

Modern highways and historic automobile roads mark a progressive improvement of earlier wagon roads, often straightening and altering their paths for the different considerations of automobile traffic as distinguished from earlier horse traffic. Modern vehicle routes often directly follow atop historic routes when possible, as the older routes commonly provide existing upgraded or improved access corridors. Often these historic routes have been reused or upgraded by other later historic routes ranging in periods from wagon trails through early to more modern automobile roads. Modern routes typically differ from previous route based on road conditions, which are related to drainage channel crossings, erosion, and a wide range of topographical considerations.

By World War I, the "Lincoln Highway" had been built following the route of the Transcontinental Railroad through the Wyoming Basin. The Rock Springs Automobile Road extended north from the Lincoln Highway to Pinedale, as an internal combustion vehicle alternative to the New Fork Wagon Road (Huston 2000:35–36, Vlcek 1999). The highway system that had been growing ostensibly since the 1920s, which expanded after each World War, essentially replaced the need for many of the alternate rural routes. Post-World War II spread of transportation and automobiles also diminished the need for railroad networks and were complicit in the "depletion" of small town populations in the West.

The Rock Springs Automobile Road (48SU3508) was used between 1907 and 1934 (McNees et al. 2006), being first surfaced for all-weather use in 1926 (Huston 2000:40). U.S. Highway 187 (48SU1281) was later developed between 1934 and 1952, in yet another alignment similar to that of the Rock Springs Automobile Road, in response to the needs of more modern automobile traffic (McNees et al. 2006). Today that highway route has been redesignated as Highway 191, although the current Highway 191 route does not totally overlap the earlier Highway 187 route (Huston 2000:36).

The Opal Wagon Road began use in 1882 as an important freight/stage wagon route between the shipping rail head in Opal to the Upper Green River valley. It was used as a freight/stage road until 1924, when a new road was constructed providing access to the area (Rosenberg 1985). Thus, 1924 marks the end of the period of importance for the Opal Wagon Road. Following the numbering convention of the surveyors, the updated road was designated Sublette County Road No. 20, and it was named the Opal – Horse Creek Road (48SU7034). Sublette County Road No. 20 (48SU1595) was replaced by Wyoming 287 in 1926 (Huston 2000:40, Field and Nitzman 2009). Wyoming 287 was recommissioned as U.S. 89 in 1936, and in 1939 this highway was abandoned and replaced by modern U.S. 189, which is in use today (Field and Nitzman 2009).

Well-developed transportation networks and an expanding energy (primarily hydrocarbon and uranium) market have helped the growth of larger population centers, like Rock Springs, and often helped suburbanize their immediate radii. Hard rock mining also continued to play a role in the regional economy. From 1960 to the 1980s, U.S. Steel built and operated a 77-mile railroad spur from the Atlantic City Iron Mine at South Pass to Rock Springs. The spur transported iron ore pellets to the Union Pacific Railroad and on to the Geneva Steel Foundry in Utah. This railroad spur parallels Highways 28 and 191 through the Project study area. To the east, the Project passes Jeffrey City, which was a center of uranium production from 1960 to 1980 (Moulton 1995:189). Reclaimed mines are in the Project vicinity north of Jeffrey City. Today, cattle ranches, fluid mineral developments, and uranium mines remain visible directly around the Project study area.

3.2.2.3 Baseline Cultural Resources Inventory

Baseline cultural resource data were collected within a 1-mile-wide corridor for the Proposed Action (Ollie et al. 2016). Baseline data consists of a literature search of 100 percent of the Project study area, resulting in the compilation of known cultural resources site data (including TCPs), NRHP-listed properties, NHTs, NHT-associated sites and potential NHT-associated sites, and ACECs. Additional cultural data examined for the literature search include GLO survey plats (1883 to 1940) available on the Official Land Records site managed by the BLM. All available GLO maps for the Project study area were reviewed for the presence of historic features, transportation routes, and telecommunications lines. The search parameters follow current SHPO guidelines for site definitions.

In accordance with 36 CFR 800 (implementing regulations for the NHPA), the BLM has identified an APE in which direct and indirect effects on historic properties from the Proposed Action could occur. The APE for the Project is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" (36 CFR 800.16[b]). As agreed on by the consulting parties during Section 106 calls, the indirect effects and direct effects APE are as follows:

- The direct effects APE for the purpose of the EIS analysis is a 200-foot-wide corridor (100 feet on either side of the reference centerline) centered on each alternative route and route variation.
- The indirect effects APE is 1 mile (0.5 mile on either side of the reference centerline).
- For NHTs, the indirect effect APE is a radius of 3 miles from any NHT crossing or 3 miles from any NHT.
- The indirect effects APE for the Parting of the Ways on the Oregon, California, Mormon Pioneer, and Pony Express NHTs is a radius of 4 miles from this historic site.

Due to the nature of the cultural resource data inventory, discussion of Cultural Resources is organized by alternative routes.

3.2.2.3.1 Cultural Resources Site Data

The literature search for the Project involved obtaining existing information on known cultural resources sites and cultural resource inventories previously conducted from the files of several agencies and institutions, including the Wyoming Cultural Records Office (WYCRO), a division of the Wyoming SHPO, the BLM Pinedale and Rock Springs Field Offices, and other appropriate land-management agencies. The BLM Pinedale Field Office provided information concerning sites from an Ultra Pipeline Project that was cancelled and has not yet been submitted to the SHPO and shapefiles for the Teakettle Dune Field (refer to Wittke 2011), and the BLM Rock Springs Field Office provided shape files for the North Sublette Meadow Springs variant of the Sublette Cutoff. The BLM Rock Springs Field Office provided shape files for the West Sand Dunes Archaeological District. It should be noted that the West Sand Dunes Archaeological District is not a National Register District or Designation; this area is only identified as a District in the BLM Green River RMP.

To obtain a comprehensive list of all known sites and inventories in the Project study area, the Applicant acquired WYCRO GIS data for all alternative routes and WYCRO database tabular data for all legal sections within the 1-mile corridor for each alternative route and route variation (refer to Ollie et al. 2016). This cultural analysis includes portions of the Teakettle Dune Field, the West Sand Dunes Archaeological District, and the Yellow Point Ridge lithic landscape (48SU1334). The lithic landscape is located southweast of the confluence of the Green and New Fork rivers, crossing all alternative routes in Segments 1 and 2. There are numerous discrete cultural loci located within the greater site boundary that are representative of lithic procurement and reduction activities. Yellow Point Ridge lithic landscape (48SU1334) was recommended not eligible for the NRHP with SHPO concurrence.

As part of the literature search, information regarding designated TCPs and Native American concerns in and adjacent to the Project study area was collected. For further information regarding TCPs and Native American concerns, refer to Section 3.2.8.

3.2.2.3.2 Historic Properties Listed in the National Register of Historic Places

The NRHP is "the official list of the Nation's historic places worthy of preservation" (NPS 2014). It is authorized by the NHPA and is maintained by the NPS. The NRHP was examined to determine if additional historic resources (i.e., districts, structures, buildings, objects, and sites), which are not found in the WYCRO archaeological records, have been documented in the study corridor. The NRHP website provides GIS spatial data for many of the listed properties through its Internet download center, available at http://www.nps.gov/nr/research/index.htm.

3.2.2.3.3 National Historic Trails

For information regarding designated NHTs and NHT-associated sites in the Project study area, refer to Section 3.2.7.

3.2.2.3.4 Areas of Critical Environmental Concern

For information regarding ACECs with cultural components, refer to Section 3.2.16.

3.2.2.4 Cultural Resources Inventory Summary

3.2.2.4.1 Cultural Resources Site Data

The literature search resulted in the identification of 1,280 known sites in the Project study area (1-mile-wide corridor [Ollie et al. 2016]). Of these, 78 percent (n=1,005) are prehistoric sites, 14 percent (n=178) are historic sites, and 8 percent (n=97) are multi-component sites (prehistoric and historic components).

Three additional site records did not provide sufficient information and were excluded from the count as a result; these sites include three rock cairns of unknown temporal affiliation. Table 3-45 provides a summary of the number of sites by NRHP eligibility status and temporal affiliation.

Table 3-45
Number of Sites by National Register of Historic Places Eligibility Status and Temporal Affiliation

Eligibility	Number of Known Sites			Total Number of Known Sites
	Prehistoric	Historic	Multi-component	
Listed Sites	0	2	1	3
NRHP-Eligible Sites	183	34	21	238
Not Eligible Sites	490	114	48	652
Unevaluated Sites[1]	332	28	27	387
Total[2]	1,005	178	97	1,280

NOTES:
[1]Unevaluated sites are treated as eligible until a determination of NRHP eligibility can be made.
[2]Three additional site records (rock cairns) did not provide sufficient information and were excluded from the count as a result.

Site types identified include prehistoric lithic scatters, prehistoric and historic artifact scatters, prehistoric lithic procurement areas, prehistoric and historic campsites, prehistoric and historic rock cairns, prehistoric structural sites (house pits, rock shelters, lodges, and stone circles), prehistoric and historic rock art, prehistoric human burial sites, historic homesteads and ranches, town sites, mining-related sites, standing structures, bridges, a historic natural landmark (Boars Tusk), a cemetery, a railroad camp, and multiple historic linear sites (canal, utility line, railroad, road, and trail segments). Historic linear sites include segments of the Oregon NHT, the Mormon Pioneer NHT, the California NHT, the Pony Express NHT, the Sublette Cutoff of the California NHT, the Bridger Trail, and the Opal Wagon Road. The main route of the Oregon NHT, the Mormon Pioneer NHT, the California NHT, and the Pony Express NHT overlap throughout the Project study area. For brevity, these overlapping trail segments are collectively referred to herein as the "Emigrant NHTs." For information regarding designated NHTs and NHT-associated sites in the Project study area, refer to Section 3.2.7.

Additional trails/roads include the Opal Wagon Road (48SU852), the New Fork Wagon Road (48SU1408), the Green River/South Pass Road (48SW3864), the Rawlins to Fort Washakie Road (48FR415), the Bryan to South Pass Stage Road (48SW3869), the Rock Springs to Lander Road (48SW4163), the New Fork to Rock Springs Road (48SW17676), the Yellowstone Highway (48NA1975), and the Casper to Lander Road (48FR1783). Of note, the Point of Rocks to South Pass Road (data not available in WYCRO) is in the Project study area. The Point of Rocks to South Pass Road, a historic stage route significant to regional history, connected the Union Pacific Railroad Station at Point of Rocks to the Sweetwater goldfield at South Pass City. The highest occurrence of significant historic trails is in Alternatives 3A: Proposed Action and 3C: Lost Creek to Highway 20/26.

Multi-component sites include a combination of prehistoric and historic features (e.g., cairns, hearths, and stained and fire-cracked rock), prehistoric lithic scatters and historic debris, and rock art with both prehistoric and historic elements. Cultural resources encompass a broad range of cultural and temporal affiliations (from the Paleoindian to the Historic period). Table 3-46 provides a summary of baseline cultural resource data for each alternative route and route variation.

To facilitate comparison of alternative routes, numbers of potential additional sites were projected for each alternative route (Table 3-46). Site projections were calculated based on the average number of known sites per 100 acres (site density) for those areas that have been previously inventoried within each 1-mile-wide corridor (Ollie et al. 2016). Table 3-46 presents the known numbers of sites within each 1-mile-wide corridor based on surveyed areas and what the projected number of sites within each 1-mile-wide corridor may be based on the estimated site density. In addition, the projected number of sites within

the direct effects APE was assessed by using the percentage of areas unsurveyed in each direct effects APE and applying the estimated site density to those areas and adding these findings to the known site totals (Ollie et al. 2016). Site projections are not necessarily representative of all sites that may, or may not, be present in the Project study area. Site projections are listed and discussed in Section 4.3.2, and Tables 4-27 and 4-28.

Of the 1,280 sites previously identified in the study area, 51 percent (n=652) do not meet the criteria for eligibility for listing in the NRHP and have been evaluated as not eligible sites. Eighteen percent (n=238) of the sites have been evaluated as eligible for inclusion in the NRHP. Eligibility for inclusion in the NRHP was not evaluated for 30 percent (n=387) of the sites. Three historic properties (less than 1 percent of the cultural resources data set) are listed in the NRHP. These sites are the Arapahoe and Lost Creek site (48SW4882), the Waltman Crossing (48NA561), and the Powder River Train Station (48NA808). The relatively large number of unevaluated sites is due in part to past geophysical inventories where sites were left unevaluated for NRHP eligibility. Some prehistoric sites may be left unevaluated pending tribal consultation. These sites are distributed across the entire Project study area; however, the ratio of unevaluated sites to total sites recorded is highest in Alternatives 1A: Proposed Action and 1C: Figure Four (33 to 34 percent of sites). These results are summarized in Table 3-45.

Prehistoric sites comprise the majority of all sites, and they also account for 77 percent (n=183) of all NRHP-eligible sites. Eligible prehistoric sites are most often open camps with buried components that contain multiple diagnostic artifacts or features (e.g., hearths, stained soil, and processing stations). Less common eligible prehistoric sites include rock cairns, lithic scatters, and habitation sites. Eligible prehistoric sites appear to cluster near the Green Mountains and Crook Mountain area, as well as near the Rattlesnake Hills and the West Sand Dunes Archaeological District. A possible explanation for this pattern is the prevalence of natural springs in the Green Mountain area that may have supported longer or repeated occupations (Ollie et al. 2016). Additionally, the Rattlesnake Hills and Green Mountains provide biogeographic ‘islands’ of increased faunal and floral diversity surrounded by dry basin environments with more marginal habitat (Ollie et al. 2016). When comparing NRHP-eligible prehistoric sites to all prehistoric sites within the 1-mile-wide corridors, Alternative 1C: Figure Four has a higher percentage of sites when compared with Alternatives 1A: Proposed Action and 1B: Dry Piney; Alternative 2B: Southern Route has a higher percentage of sites when compared with Alternative 2A: Proposed Action; and among the most eastern alternative routes, Alternative 3A: Proposed Action has a higher percentage of NRHP-eligible prehistoric sites than Alternatives 3B: Lost Creek to Lost Cabin and 3C: Lost Creek to Highway 20/26.

Alternative 2A: Proposed Action has a higher site density than Alternative 2B: Southern Route. In addition, Alternative 2A: Proposed Action crosses landforms with the potential to have a higher site density when compared with Alternative 2B: Southern Route. Previous cultural resources inventory of 640 acres of the 4,188-acre Teakettle Dune Field identified 45 sites recommended to be eligible for the NRHP (Zietz et al. 2010). The Teakettle Dune Field is the most notable concentration of aeolian deposits between the Green River and Big Sandy. The dune field was named after the nearby Teakettle Butte (Wittke 2011, Zietz et al. 2010). Only 73 acres of that previous work occurred within the 1-mile-wide corridor of Alternative 2A: Proposed Action and included five NRHP-eligible sites (one previously recorded site [48SU4609] and four newly recorded sites [48SU7126, 48SU7127, 48SU7143, and 48SU7144]). The 1-mile-wide corridor along this portion of Alternative 2A: Proposed Action overlaps with 1,202 acres of the Teakettle Dune Field and, except for the sites identified in 2010 and listed above, contains no previously recorded cultural resources. Based on the previous work conducted outside the 1-mile-wide corridor, it appears this area has potential to contain significant cultural resources. However, density of dune deposits is lower in this portion of the dune field as compared to that previously inventoried.

Table 3-46
Summary of Cultural Resources Inventory Data by Alternative Route and Route Variation

Alternative Route	Sites in the 1-Mile-Wide Corridor																	Sites in the Direct Effects Area of Potential Effects					
	Number of Known Sites															Site Projections[2]				Number of Known Sites		Site Projections[3]	
	NRHP-Eligible			Not Eligible			Unevaluated																
	Prehistoric	Historic	Multi-component	Prehistoric	Historic	Multi-component	Prehistoric	Historic	Multi-component	Known NRHP-Listed Properties[1]	Total Number of Known Historic Properties	Total Number of Known Sites	Total Acres	Acres Survey	Percentage of Cultural Resources Survey Coverage	Average Number of Sites Per 100 Acres Inventoried	Total Number of Known and Projected Sites	Total number of Known and Projected Historic Properties	Total Acres	Percentage of Cultural Resources Survey Coverage	Known Sites	Known Historic Properties	Total Number of Known and Projected Sites	Total Number of Known and Projected Historic Properties
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant																								
1A: Proposed Action	17	2	0	75	6	2	49	2	1	0	19	154	19,650	5,937	30	2.59	510	63	736	45	22	3	32	4
1AP Variation: Dry Basin Draw Proposed Action[4]	4	0	0	21	1	0	3	0	0	0	4	29	2,147	2,072	96	1.4	30	4	63	81	1	0	1	0
1AV Variation: Dry Basin Draw Variation[4]	3	0	0	23	1	0	6	0	0	0	3	33	2,320	2,034	88	1.6	38	3	71	41	3	1	4	1
1B: Dry Piney	20	3	0	72	9	3	41	3	1	0	23	152	22,355	11,039	49	1.38	308	47	836	41	26	5	33	6
1C: Figure Four	48	3	2	96	15	6	84	3	0	0	53	257	24,738	19,049	77	1.35	334	69	931	63	34	9	39	10
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect																								
2A: Proposed Action	45	7	5	104	8	11	44	2	10	1	57	236	82,757	5,160	6	4.57	3,785	914	3,131	23	81	28	192	66
2B: Southern Route	56	10	1	100	6	8	46	2	6	1	67	235	87,502	6,647	8	3.54	3,094	882	3,303	17	90	31	187	64
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect																								
3A: Proposed Action	32	11	2	92	14	6	53	13	5	0	47	230	53,553	10,247	19	2.24	1,202	246	2,018	27	64	12	97	18
3B: Lost Creek to Lost Cabin	35	10	5	87	39	11	66	8	7	0	50	268	47,029	12,614	27	2.12	999	186	1,770	36	106	21	130	26
3C: Lost Creek to Highway 20/26	39	18	10	115	56	20	77	12	10	2	67	357	65,215	15,615	24	2.29	1,491	280	2,460	42	101	23	133	30

NOTES:
[1]The NRHP-listed "Parting of the Ways" is not included in this table; this historic property was evaluated out to 4 miles per the BLM's request.
[2]Site projections were calculated based on the average number of sites per 100 acres (site density) for those areas that have been previously inventoried within each 1-mile-wide corridor (Ollie et al. 2016). Site projections are discussed in Section 4.3.2.5.
[3]The projected number of sites in the direct effects APE was assessed by using the percentage of areas unsurveyed in each direct effects APE and applying the estimated site density to those areas and adding these findings to the known site totals (Ollie et al. 2016). Site projections are discussed in Section 4.3.2.5.
[4]As per cultural analysis presented in Ollie et al. 2016.

THIS PAGE INTENTIONALLY LEFT BLANK

Overall, Alternative 2B: Southern Route has the highest percentage of known eligible prehistoric sites. This alternative route also crosses the West Sand Dunes Archaeological District, which is designated as such due to the abundance of significant buried prehistoric sites. According to the WYCRO database, one NRHP-eligible site (48SW305) and one unevaluated Paleoindian site (48SW13620) occur within the 1-mile-wide corridor, although there is discrepancy in this information and site form data. Extensive dune deposits with subsurface archaeological potential continue outside of this boundary.

Historic sites comprise 14 percent of all NRHP-eligible sites (n=34). Known eligible historic sites are closely tied to significant transportation corridors. Some of these sites include the Chicago and Northwest Railroad, the Casper to Lander Road, and the Bridger Trail. The Crooks Gap–Sheep Mountain and Sweetwater River area contain a high number of eligible historic sites attributed to the Emigrant NHTs and the Rawlins to Fort Washakie Road. Other notable areas where historic eligible sites occur are near Little Sandy Creek (e.g., Rock Springs to Atlantic Railroad Spur, Sublette Cutoff of the California NHT, and the Emigrant NHTs). Eligible historic sites also occur west of the Green River and they are mostly attributed to the Opal Wagon Road. Another area with significant historic linear resources is the Jack Morrow Hills area. Linear resources include an 1880s military road, the Oregon and Northwest Railroad, Chicago Burlington and Quincy Railroad, and the Rock Springs to Atlantic City Railroad Spur, which was used to transport iron ore from mines at South Pass.

Multi-component sites comprise 9 percent of all eligible sites (n=21) in the Project study area. These sites include prehistoric lithic and tool scatters, rock cairns, rock alignments, campsites, rock art, and lithic procurement areas with historic components (e.g., single- and multiple-episode trash scatters, inscriptions, habitation structures, campsites, and isolated features).

Overall, Alternative 3A: Proposed Action has the highest percentage of NRHP-eligible historic sites within its 1-mile-wide corridor. Alternative 3C: Lost Creek to Highway 20/26 has the second highest percentage of NRHP-eligible historic sites, approximately 5 percent of all sites within its 1-mile-wide corridor.

Finally, cultural resources inventory data indicate that 1,876 previous cultural resources surveys were conducted in the Project study area between 1974 and 2013. These cultural resources surveys, which are primarily related to oil and gas development, cover approximately 18 percent (51,980) of the total acreage of the Project study area.

The southern portion of Sublette County has received the most survey coverage and, thus, provides a more comprehensive sample of site and inventory data in that geographic region (Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant); however, portions of the Little Colorado Desert have had limited investigations. Other areas that have not been as intensively inventoried include lands south of Highway 20/26 in Fremont County and north of Highway 136 (Alternatives 3B: Lost Creek to Lost Cabin and 3C: Lost Creek to Highway 20/26), as well as territories northeast of the Rattlesnake Hills (Alternative 3A: Proposed Action) in Natrona County (Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect). Portions of north-central Sweetwater County have also received limited inventory (Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect). This includes areas around the Continental Divide, White Mountain, and Black Rock Flat.

Table 3-46 provides a summary of baseline cultural resource data (sites and previous cultural resources surveys) for each alternative route and route variation. Site density per alternative route is compared based on the number of sites per 100 acres inventoried. Based on these comparisons, Alternative 2A: Proposed Action has the greatest site density, followed by Alternative 2B: Southern Route (Table 3-46). While these densities are high, these alternative routes are also the least inventoried, and this low acreage is a biasing factor in the site density estimates. Alternative 1C: Figure Four as well as the Alternative 1A:

Variations (Dry Basin Draw Proposed Action [1AP] and Dry Basin Draw Variation [1AV]) have the most inventoried areas yet have much lower site densities (Table 3-46).

It should be noted that the GLO review identified several historic linear sites that correspond with existing WYCRO data. Historic features identified include segments of the California NHT, the Opal Wagon Road, the Road to Powder River, the Ervay to Muskrat Road, the Casper to Lander Road, the 1880 military road (unnamed), the Fort Washakie and Rawlins Road, and trail crossings such as those for the Sublette Cutoff of the California NHT (Big Sandy Wagon Road [GLO 1901]).

3.2.2.4.1.1 Historic Properties Listed in the National Register of Historic Places

Baseline information on previously identified archaeological and historical resources was reviewed to determine if any are in the study area. Of the 1,280 sites identified in the literature search, 3 are historic properties currently listed in the NRHP, including 1 historic building, 1 archaeological site, and 1 historic feature, as defined under 36 CFR 60.3(p). These results are summarized in Table 3-46.

Listed sites include the Waltman Crossing (48NA561), the Powder River Train Station (48NA808), and the Arapahoe and Lost Creek site (48SW4882). The Waltman Crossing is listed in the NRHP as a representative segment of the Bridger Trail. The name of this site refers to the crossing of the Bridger Trail by Highway 20/26 at this location west of Waltman, Wyoming (Frost 1973). Waltman Crossing was listed in the NRHP on January 17, 1975. The Powder River Train Station was built by employees of the Chicago and Northwestern Railroad, which brought new settlement into central Wyoming as the first railroad in the area. This train station has since been destroyed. The Powder River Train Station was listed in the NRHP on January 7, 1988. The Arapahoe and Lost Creek site (48SW4882) spans multiple prehistoric time periods and is recognized as containing an extensive record of settlement patterns in the Wyoming Basin. The Arapahoe and Lost Creek site (48SW4882) was listed in the NRHP on March 12, 1986.

In addition to the literature search, this cultural analysis includes the Parting of the Ways (48SW4198), an NRHP-listed property located within 4 miles of Alternative 2A: Proposed Action. As stated previously, the Parting of the Ways is a key resource identified by the public and agencies during internal coordination and agency and public scoping. The Parting of the Ways is the intersection where the Sublette Cutoff departs from the main Emigrant NHTs. The cutoff offered a more direct westward route toward Oregon, crossing the Little Colorado Desert, albeit with limited water availability, while the main route continued in a southwesterly direction toward Fort Bridger and on to California (Benton 1973). The cutoff was established by a mountaineer named Greenwood in 1844 (Benton 1973). The Parting of the Ways was listed in the NRHP on January 11, 1976.

3.2.2.4.1.2 National Historic Trails

For information regarding designated NHTs and NHT-associated sites in the Project study area, refer to Section 3.2.7.

3.2.2.4.1.3 Areas of Critical Environmental Concern and Other Management Areas

For information regarding ACECs with cultural components, refer to Section 3.2.16.

3.2.2.4.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

3.2.2.4.2.1 Alternative 1A: Proposed Action

Cultural Resources Sites

Thirty percent of Alternative 1A: Proposed Action has been inventoried intensively for cultural resources. Cultural resources survey covered 5,937 acres of the 19,650 acres for the alternative route (Table 3-46). There are 154 sites recorded along this alternative route; these include 19 historic properties. Of the 154 known sites, 22 are in the direct effects APE with 3 of those sites being historic properties. Based on cultural data from the area that has been inventoried to date, the average number of known sites per 100 acres inventoried is 2.59. Class III inventory likely will result in more and/or different types of sites recorded. Projections of the number of sites and NRHP-eligible sites that could be expected along Alternative 1A: Proposed Action based on existing data are provided in Section 4.3.2.5.

Of the 154 sites identified in the literature search conducted for Alternative 1A: Proposed Action, 141 are prehistoric sites, 10 are historic sites, and 3 are multi-component sites (prehistoric and historic components). Site types include prehistoric and historic campsites, prehistoric lithic scatters, prehistoric lithic procurement areas, prehistoric habitations (stone circles), prehistoric and historic rock cairns, historic rock art (inscriptions), historic artifact scatters, one oil/gas well/field, and multiple historic linear sites (i.e., canal and road segments). Multi-component sites include a combination of prehistoric and historic features (e.g., cairns, hearths, and stained and fire-cracked rock), prehistoric lithic scatters and historic debris, and rock art with both prehistoric and historic elements. The Opal Wagon Road is crossed by this alternative route.

Known NRHP-eligible sites include prehistoric campsites, prehistoric stone circles, a prehistoric rock cairn, the Opal Wagon Road, and historic inscriptions, most likely associated with the wagon road. Table 3-46 provides a summary of baseline cultural resource data for this alternative route.

In addition to the above-mentioned cultural resources, the Lander Cutoff of the California NHT (48SU387) has been documented 1.3 miles northeast of Alternative 1A: Proposed Action (data not available in WYCRO). For information regarding designated NHTs in the Project study area, refer to Section 3.2.7.

Historic Properties Listed in the National Register of Historic Places

There are no known historic properties listed in the NRHP along Alternative 1A: Proposed Action.

3.2.2.4.2.2 Alternative 1A: Variations (Dry Basin Draw Proposed Action [1AP] and Dry Basin Draw Variation [1AV])

Ninety-six percent of Alternative 1AP Variation: Dry Basin Draw Proposed Action has been inventoried intensively for cultural resources. Cultural resources survey covered 2,072 acres of the 2,147 acres for the route variation (Table 3-46). There are 29 known sites recorded along this route variation; these include 4 historic properties. Based on cultural data from the area that has been inventoried to date, the average number of known sites per 100 acres inventoried is 1.4. Class III inventory likely will result in more and/or different types of sites recorded.

Of the 29 sites identified in the literature search conducted for Alternative 1A Variation 1AP: Dry Basin Draw Proposed Action, 28 are prehistoric sites and 1 is a historic site. Site types include prehistoric campsites, prehistoric stone circles, a prehistoric lithic scatter, and an historic oil/gas well/field. NRHP-eligible sites include 3 prehistoric campsites and 1 prehistoric stone circle.

Of a total of 2,320 acres for Alternative 1AV Variation: Dry Basin Draw Variation, 2,034 (88 percent) have been inventoried intensively for cultural resources (Table 3-46). There are 33 known sites recorded along this route variation; these include 3 historic properties. Based on cultural data from the area that has been inventoried to date, the average number of known sites per 100 acres inventoried is 1.6. This would indicate that there are a greater number of potential sites to be encountered along this route variation than along Alternative 1AP Variation: Dry Basin Draw Proposed Action even though less area has been inventoried.

Sites potentially affected by Alternative 1A Variation 1AV: Dry Basin Draw Variation are similar to those identified for Alternative 1A Variation 1AP: Dry Basin Draw Proposed Action. A total of 33 known sites potentially could be affected if Alternative 1A Variation 1AV: Dry Basin Draw Variation was selected, compared to 29 known sites for Alternative 1A Variation 1AP: Dry Basin Draw Proposed Action. Due to their proximity to each other, significant overlap in the 1-mile corridors is apparent and differences in site type and density are few. Alternative 1A Variations 1AP: Dry Basin Draw Proposed Action and 1AV: Dry Basin Draw Variation share 17 known sites within their associated 1-mile-wide corridors. Of the 33 sites previously identified along Route Variation 1AV, sites unique to the route variation are 15 prehistoric campsites and 1 prehistoric lithic scatter. Four are of unknown NRHP eligibility and 11 are not eligible for NRHP nomination. Sites unique to Alternative 1A Variation 1AP: Dry Basin Draw Proposed Action are also all prehistoric sites and include 11 campsites and 1 stone circle. Of these, 9 campsites have been evaluated as not eligible for the NRHP; 1 structural site (stone circle) has been evaluated as eligible for the NRHP, and 2 campsites were left unevaluated. Table 3-46 provides a summary of baseline cultural resource data for these route variations. Projections of the number of sites and NRHP-eligible sites that could be expected along these route variations based on existing data are provided in Section 4.3.2.5.

The Lander Cutoff of the California NHT (48SU387) is located more than 4.5 miles north of the centerline for Alternative 1A Variations 1AP: Dry Basin Draw Proposed Action and 1AV: Dry Basin Draw Variation (data not available in WYCRO). For information regarding designated NHTs in the Project study area, refer to Section 3.2.7.

3.2.2.4.2.3 Alternative 1B: Dry Piney

Cultural Resources Sites

Forty-nine percent of Alternative 1B: Dry Piney has been inventoried intensively for cultural resources. Cultural resources survey covered 11,039 acres of the 22,355 acres for the alternative route (Table 3-46). There are 152 known sites recorded along this alternative route; these include 23 historic properties. Of the 152 known sites, 26 are in the direct effects APE with 5 of those sites being historic properties. Based on cultural data from the area that has been inventoried to date, the average number of known sites per 100 acres inventoried is 1.38. Class III inventory likely will result in more and/or different types of sites recorded. Projections of the number of sites and NRHP-eligible sites that could be expected along Alternative 1B: Dry Piney based on existing data are provided in Section 4.3.2.5.

Of the 152 sites identified in the literature search conducted for Alternative 1B: Dry Piney, 133 are prehistoric sites, 15 are historic sites, and 4 are multi-component sites (prehistoric and historic components). Site types include prehistoric lithic scatters, prehistoric campsites, prehistoric lithic procurement areas, prehistoric stone circles, prehistoric and historic rock cairns, homesteads, prehistoric artifact scatters, historic rock art, and multiple historic linear sites (canal and road segments). Multi-component sites include a combination of prehistoric and historic features (e.g., cairns, hearths, and stained and fire-cracked rock), prehistoric lithic scatters and historic debris, and rock art with both prehistoric and historic elements. The Opal Wagon Road is crossed by this alternative route.

Known NRHP-eligible sites include prehistoric campsites, prehistoric lithic scatters, a lithic procurement area, a prehistoric rock cairn, the Opal Wagon Road, a homestead, and historic inscriptions, most likely associated with the wagon road. Table 3-46 provides a summary of baseline cultural resource data for this alternative route.

The Lander Cutoff of the California NHT (48SU387) is located within 3 miles of this alternative route (data not available in WYCRO). For information regarding designated NHTs in the Project study area, refer to Section 3.2.7.

Historic Properties Listed in the National Register of Historic Places

There are no known historic properties listed in the NRHP along Alternative 1B: Dry Piney.

3.2.2.4.2.4 Alternative 1C: Figure Four

Cultural Resources Sites

Seventy-seven percent of Alternative 1C: Figure Four has been inventoried intensively for cultural resources. Cultural resources survey covered 19,049 acres of the 24,738 acres for the alternative route (Table 3-46). There are 257 known sites recorded along this alternative route; these include 53 historic properties. Of the 257 known sites, 34 are in the direct effects APE with 9 of those sites being historic properties. Based on cultural data from the area that has been inventoried to date, the average number of known sites per 100 acres inventoried is 1.35. Class III inventory likely will result in more and/or different types of sites recorded. Projections of the number of sites and NRHP-eligible sites that could be expected along Alternative 1C: Figure Four based on existing data are provided in Section 4.3.2.5.

Of the 257 sites identified in the literature search conducted for Alternative 1C: Figure Four, 228 are prehistoric sites, 21 are historic sites, and 8 are multi-component sites (prehistoric and historic components). Site types include prehistoric lithic scatters, prehistoric campsites, prehistoric lithic procurement areas, prehistoric structural sites (rock shelter, stone circles, and rock alignments), prehistoric and historic rock art, prehistoric and historic rock cairns, historic artifact scatters, bridges, oil/gas wells/fields, mining camps, a homestead, and multiple historic linear sites (canal and road segments). Multi-component sites include a combination of prehistoric and historic features (e.g., cairns, hearths, and stained and fire-cracked rock), prehistoric lithic scatters and historic debris, and rock art with both prehistoric and historic elements. The Opal Wagon Road is crossed by this alternative route.

Known NRHP-eligible sites include prehistoric campsites, prehistoric lithic and artifact scatters, prehistoric lithic procurement areas, prehistoric and historic rock art, a prehistoric rock cairn, the Opal Wagon Road, a mining camp, a campsite with prehistoric and historic artifacts, and a rock art site with prehistoric and historic elements. Table 3-46 provides a summary of baseline cultural resource data for this alternative route.

The Lander Cutoff of the California NHT (48SU387) is located within 3 miles of this alternative route (data not available in WYCRO). For information regarding designated NHTs in the Project study area, refer to Section 3.2.7.

Historic Properties Listed in the National Register of Historic Places

There are no known historic properties listed in the NRHP along Alternative 1C: Figure Four.

3.2.2.4.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

3.2.2.4.3.1 Alternative 2A: Proposed Action

Cultural Resources Sites

Six percent of Alternative 2A: Proposed Action has been inventoried intensively for cultural resources. Cultural resources survey covered 5,160 acres of the 82,757 acres for the alternative route (Table 3-46). There are 236 known sites recorded along this alternative route; these include 57 historic properties. Of the 236 known sites, 81 are in the direct effects APE with 28 of those sites being historic properties. Based on cultural data from the area that has been inventoried to date, the average number of known sites per 100 acres inventoried is 4.57. Class III inventory likely will result in more and/or different types of sites recorded. Projections of the number of sites and NRHP-eligible sites that could be expected along Alternative 2A: Proposed Action based on existing data are provided in Section 4.3.2.5.

Of the 236 sites identified in the literature search conducted for Alternative 2A: Proposed Action, 193 are prehistoric sites, 17 are historic sites, and 26 are multi-component sites (prehistoric and historic components). Site types include prehistoric lithic scatters, prehistoric and historic artifact scatters, prehistoric campsites, prehistoric lithic procurement areas, prehistoric structural sites (house pits and possible lodge), prehistoric rock cairns, ranch sites, and multiple historic linear sites (railroad, canal, trail, and road segments). Multi-component sites include a combination of prehistoric and historic features (e.g., cairns, hearths, and stained and fire-cracked rock), prehistoric lithic scatters and historic debris, and prehistoric rock art. The NRHP-listed Arapahoe and Lost Creek site (48SW4882), the Sublette Cutoff of the California NHT, and the Emigrant NHTs are crossed by this alternative route. For information regarding designated NHTs in the Project study area, refer to Section 3.2.7.

Known NRHP-eligible sites include prehistoric campsites, prehistoric lithic scatters, prehistoric lithic procurement areas, prehistoric structures (house pits and possible lodge), and several transportation corridors (trail [including NHTs and variants of NHTs], road, and railroad segments). Trail variants include the North Sublette Meadow Springs variant and the Little Sandy Crossing of the Sublette Cutoff (refer to Section 3.2.7). Table 3-46 provides a summary of baseline cultural resource data for this alternative route.

Two additional resources are located along this alternative route. These include the Point of Rocks to South Pass Road (data not available in WYCRO) and the Teakettle Dune Field. The Point of Rocks to South Pass Road is crossed by this alternative route. In addition, Alternative 2A: Proposed Action crosses the southern portion of the Teakettle Dune Field. There is a high potential for unrecorded, significant cultural resources to occur in and around this area.

Historic Properties Listed in the National Register of Historic Places

The literature search and the NRHP records search identified the Arapahoe and Lost Creek site (48SW4882) along Alternative 2A: Proposed Action. This site spans multiple prehistoric time periods and is recognized as containing an excellent record of settlement patterns in the Wyoming Basin. The site was listed in the NRHP on March 12, 1986. The Arapahoe and Lost Creek site (48SW4882) is crossed by this alternative route.

In addition, the Parting of the Ways (48SW4198) is an NRHP-listed property located 3.65 miles northeast of Alternative 2A: Proposed Action. As noted previously, the Parting of the Ways is evaluated out to 4 miles, per the BLM's request. This historic property marks the location where the Emigrant NHTs and the Sublette (Greenwood) Cutoff of the California NHT diverge. The Sublette Cutoff of the California NHT offered a more direct westward route toward Oregon, crossing the Little Colorado Desert to Bear River,

while the main route continued in a southwesterly direction toward Fort Bridger and on to California (Benton 1973). The Sublette Cutoff of the California NHT was approximately 46 miles shorter; however, the lack of water made this route more challenging. The cutoff route was established by a mountaineer named Greenwood in 1844 and became popular during the California gold rush period (Benton 1973). The Parting of the Ways was listed in the NRHP on January 11, 1976.

3.2.2.4.3.2 Alternative 2B: Southern Route

Cultural Resources Sites

Eight percent of Alternative 2B: Southern Route has been inventoried intensively for cultural resources. Cultural resources survey covered 6,647 acres of the 87,502 acres for the alternative route (Table 3-46). There are 235 known sites recorded along this alternative route; these include 67 historic properties. Of the 235 known sites, 90 are in the direct effects APE with 31 of those sites being historic properties. Based on cultural data from the area that has been inventoried to date, the average number of known sites per 100 acres inventoried is 3.54. Class III inventory likely will result in more and/or different kinds of sites recorded. Projections of the number of sites and NRHP-eligible sites that could be expected along Alternative 2B: Southern Route based on existing data are provided in Section 4.3.2.5.

Of the 235 sites identified in the literature search conducted for Alternative 2B: Southern Route, 202 are prehistoric sites, 18 are historic sites, and 15 are multi-component sites (prehistoric and historic components). Site types include prehistoric lithic scatters, prehistoric and historic artifact scatters, prehistoric and historic campsites, prehistoric lithic procurement areas, prehistoric structural sites (house pits, stone circles, and possible lodge), a prehistoric rock cairn, a prehistoric human burial site, a cattle ranch, historic inscriptions, a mine, a historic natural landmark (Boars Tusk), and multiple historic linear sites (railroad and road segments). Multi-component sites include a combination of prehistoric and historic features (e.g., hearths and stained and fire-cracked rock) and prehistoric lithic scatters and historic debris/dumps. The NRHP-listed Arapahoe and Lost Creek site (48SW4882), the Sublette Cutoff of the California NHT, and the Emigrant NHTs are crossed by this alternative route. Two NHT-associated sites (Simpson's Hollow and Mormon Knolls) were identified more than 1 mile away from Alternative 2B: Southern Route. For information regarding designated NHTs in the Project study area, refer to Section 3.2.7. The Boars Tusk is located approximately 128 meters north of the centerline of this alternative route. This historic natural landmark and sacred site is an isolated volcanic remnant that has been identified as important to the Shoshone-Bannock Tribes of the Fort Hall Reservation, the Eastern Shoshone Tribe of the Wind River Reservation, the Northern Arapahoe Tribe of the Wind River Reservation, and the Ute Indian Tribe of the Uintah and Ouray Reservation. For sites of Native American concern, refer to Section 3.2.8.

Known NRHP-eligible sites consist of prehistoric campsites, prehistoric lithic and artifact scatters, prehistoric structural sites (house pits and possible lodge), and multiple transportation corridors (trail, road, and railroad segments). Some of the transportation corridors include the Bryan to South Pass Stage Road, the Rock Springs to Lander Road, and the Rock Springs to Lander Road. Table 3-46 provides a summary of baseline cultural resource data for this alternative route.

The Point of Rocks to South Pass Road (data not available in WYCRO) is also crossed by Alternative 2B: Southern Route. In addition, the Greater Sand Dunes ACEC and the West Sand Dunes Archaeological District are significant resources identified within the boundaries of Alternative 2B: Southern Route. The West Sand Dunes Archaeological District is a special management area designated to protect stabilized sand dunes and places where buried sediments potentially hold archaeological resources. The area contains a portion of the Killpecker Sand Dunes. The archaeological district, which is located north of the White Mountain in Sweetwater County, is crossed by Alternative 2B: Southern Route. There is a high potential for unrecorded NRHP-eligible prehistoric sites to occur in this area. The West Sand Dunes

Archaeological District contains the NRHP-listed Eden Farson site (48SW304) and the Finley site (48SW5), as well as numerous other Paleoindian sites, such as the Krmpotich site (48SW9826) (Moss et al. 1951, Peterson 2001). It should be noted that the White Mountain Petroglyphs are located 4 miles south of the alternative route, outside of the Project. Table 3-46 provides a summary of baseline cultural resource data for this alternative route.

Historic Properties Listed in the National Register of Historic Places

The known historic property listed in the NRHP, and located along Alternative 2B: Southern Route, is the same as that identified for Alternative 2A: Proposed Action.

3.2.2.4.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

3.2.2.4.4.1 Alternative 3A: Proposed Action

Cultural Resources Sites

Nineteen percent of Alternative 3A: Proposed Action has been inventoried intensively for cultural resources. Cultural resources survey covered 10,247 acres of the 53,553 acres for the alternative route (Table 3-46). There are 230 known sites recorded along this alternative route; these include 47 historic properties. Of the 230 known sites, 64 are in the direct effects APE with 12 of those sites being historic properties. Based on cultural data from the area that has been inventoried to date, the average number of known sites per 100 acres inventoried is 2.24. Class III inventory likely will result in more and/or different kinds of sites recorded. Projections of the number of sites and NRHP-eligible sites that could be expected along Alternative 3A: Proposed Action based on existing data are provided in Section 4.3.2.5.

Of the 230 sites identified in the literature search conducted for Alternative 3A: Proposed Action, 179 are prehistoric sites, 38 are historic sites, and 13 multi-component sites (prehistoric and historic components). Site types include prehistoric lithic scatters, prehistoric and historic artifact scatters, prehistoric and historic campsites, prehistoric lithic procurement areas, prehistoric structural sites (e.g., rock shelter, house pits, stone circles, and possible lodge), prehistoric and historic rock cairns, mining-related sites (camps and oil/gas wells/fields), homesteads/ranches, a historic standing structure, the Home on the Range Stage Station, the Crooks Gap Stage Station, a historic dugout of unknown function, and multiple historic linear sites (telegraph/telephone, power line, canal, railroad, trail, and road segments). Multi-component sites include a combination of prehistoric and historic features (e.g., hearths and stained and fire-cracked rock), prehistoric lithic scatters and historic debris, and rock art with both prehistoric and historic elements. The above-mentioned stage stations, the Rawlins to Fort Washakie Road, the Yellowstone Highway, the Casper to Lander Road, the Bridger Trail, and the Emigrant NHTs are crossed by this alternative route. Several NHT-related sites are located more than 1 mile away from the alternative route. These are associated with the Three Crossings Stage Station (48FR231) and include multiple crossings of the Sweetwater River. For information regarding designated NHTs in the Project study area, refer to Section 3.2.7.

Known NRHP-eligible sites include prehistoric campsites, prehistoric lithic and artifact scatters, prehistoric structural sites (house pits and stone circles), a homestead, a cattle ranch, the Home on the Range Stage Station, the Crooks Gap Stage Station, and several transportation corridors (trail and road segments). Table 3-46 provides a summary of baseline cultural resource data for this alternative route.

Historic Properties Listed in the National Register of Historic Places

There are no known historic properties listed in the NRHP along Alternative 3A: Proposed Action.

3.2.2.4.4.2 Alternative 3B: Lost Creek to Lost Cabin

Cultural Resources Sites

Twenty-seven percent of Alternative 3B: Lost Creek to Lost Cabin has been inventoried intensively for cultural resources. Cultural resources survey covered 12,614 acres of the 47,029 acres for the alternative route (Table 3-46). There are 268 known sites recorded along this alternative route; these include 50 historic properties. Of the 268 known sites, 106 are in the direct effects APE with 21 of those sites being historic properties. Based on cultural data from the area that has been inventoried to date, the average number of known sites per 100 acres inventoried is 2.12. Class III inventory likely will result in more and/or different kinds of sites recorded. Projections of the number of sites and NRHP-eligible sites that could be expected along Alternative 3B: Lost Creek to Lost Cabin based on existing data are provided in Section 4.3.2.5.

Of the 268 sites identified in the literature search conducted for Alternative 3B: Lost Creek to Lost Cabin, 189 are prehistoric sites, 56 are historic sites, and 23 are multi-component sites (prehistoric and historic components). Site types include prehistoric lithic scatters, prehistoric and historic campsites, isolated hearths, prehistoric structural sites (house pits, stone circles, and possible lodge), prehistoric rock cairns, a prehistoric lithic procurement area, a prehistoric human burial site, historic artifact scatters/dumps, oil/gas wells/fields, cattle ranches, the Home on the Range Stage Station, the Crooks Gap Stage Station, a historic foundation, a historic standing structure, historic inscriptions, and numerous historic linear sites (railroad, canal, telegraph/telephone, trail, and road segments). Multi-component sites include a combination of prehistoric and historic features (e.g., cairns, hearths, and stained and fire-cracked rock), prehistoric lithic scatters and historic debris, and rock art with both prehistoric and historic elements. The above-mentioned stage stations, the Rawlins to Fort Washakie Road, the Bridger Trail, and the Emigrant NHTs are crossed by this alternative route. NHT-associated sites located along this alternative route are the same as those for Alternative 3A: Proposed Route. For information regarding designated NHTs in the Project study area, refer to Section 3.2.7.

Known NRHP-eligible sites include prehistoric campsites, prehistoric lithic scatters, prehistoric structural sites (house pits and stone circles), a cattle ranch, the Home on the Range Stage Station, the Crooks Gap Stage Station, and several transportation corridors (trail, road, and railroad segments). Additional NRHP-eligible sites include prehistoric lithic scatters and campsites with historic elements (artifact scatters and hearths). Table 3-46 provides a summary of baseline cultural resource data for this alternative route.

Historic Properties Listed in the National Register of Historic Places

There are no known historic properties listed in the NRHP along Alternative 3B: Lost Creek to Lost Cabin.

3.2.2.4.4.3 Alternative 3C: Lost Creek to Highway 20/26

Cultural Resources Sites

Twenty-four percent of Alternative 3C: Lost Creek to Highway 20/26 has been inventoried intensively for cultural resources. Cultural resources survey covered 15,615 acres of the 65,215 acres for the alternative route (Table 3-46). There are 357 known sites recorded along this alternative route; these include 67 historic properties. Of the 357 known sites, 101 are in the direct effects APE with 23 of those sites being historic properties. Based on cultural data from the area that has been inventoried to date, the average number of known sites per 100 acres inventoried is 2.29. Class III inventory likely will result in more and/or different kinds of sites recorded. Projections of the number of sites and NRHP-eligible sites that could be expected along Alternative 3C: Lost Creek to Highway 20/26 based on existing data are provided in Section 4.3.2.5.

Of the 357 sites identified in the literature search conducted for Alternative 3C: Lost Creek to Highway 20/26, 231 are prehistoric sites, 86 are historic sites, and 40 are multi-component sites (prehistoric and historic components). Site types include prehistoric lithic scatters, prehistoric and historic campsites, prehistoric lithic procurement areas, prehistoric structural sites (e.g., house pits, stone circles, and possible lodge), prehistoric rock cairns, historic artifact scatters, homesteads and ranches, historic standing structures (including a school building), a mining camp, an oil/gas wells/field, historic bridges, historic inscriptions, a cemetery, a historic foundation, the Home on the Range Stage Station, the Crooks Gap Stage Station, a railroad camp, and numerous historic linear sites (telegraph/telephone line, railroad, canal, trail, and road segments). Multi-component sites include a combination of prehistoric and historic features (e.g., hearths and stained and fire-cracked rock), prehistoric lithic scatters and historic debris, and rock art with both prehistoric and historic elements. The above-mentioned stage stations, the Rawlins to Fort Washakie Road, the Yellowstone Highway, the Casper to Lander Road, the Bridger Trail, and the Emigrant NHTs are crossed by this alternative route. NHT-associated sites located along this alternative route are the same as those for Alternative 3A: Proposed Route. For information regarding designated NHTs in the Project study area, refer to Section 3.2.7.

Known NRHP-eligible sites include prehistoric lithic scatters, prehistoric campsites, prehistoric structural sites (house pits and stone circles), Home on the Range Stage Station, Crooks Gap Stage Station, a cattle ranch, a railroad camp, and several transportation corridors (trail, road, and railroad segments). Additional NRHP-eligible sites include prehistoric campsites with historic elements (habitations, artifact scatters, and hearths). Table 3-46 provides a summary of baseline cultural resource data for this alternative route.

Historic Properties Listed in the National Register of Historic Places

The literature search and the NRHP records search identified two historic properties, the Waltman Crossing (48NA561) and the Powder River Train Station (48NA808), along Alternative 3C: Lost Creek to Highway 20/26. Waltman Crossing is a representative segment of the Bridger Trail. The name of this site refers to the crossing of the Bridger Trail by Highway 20/26 at this location west of Waltman, Wyoming (Frost 1973); the Bridger Trail did not historically cross anything at this location. Waltman Crossing was listed in the NRHP on January 17, 1975. The Powder River Train Station was built by employees of the Chicago and Northwestern Railroad, which brought new settlement into central Wyoming as the first railroad in the area. This train station has since been destroyed. The Powder River Train Station was listed in the NRHP on January 7, 1988. These NRHP-listed properties are part of the site counts mentioned above under the subheading Cultural Resources Sites.

3.2.3 Fish and Aquatic Resources

This section addresses fish species and habitats, biological communities, and ecosystem functions present in surface waters including rivers, streams, lakes, ponds, and reservoirs. Special status fish and aquatic species are those that are listed as either endangered or threatened or candidates for protection under the ESA, BLM sensitive species, or species designated for conservation need in Wyoming.

3.2.3.1 Regulatory Framework

The USFWS is the primary agency responsible for administering the ESA. Habitats for fish species in Wyoming are managed by the WGFD and the BLM. The WDEQ also indirectly contributes to protection of fish habitat and aquatic resources through regulation of water quality and watershed protection and management.

Federal and state regulations, policies, plans, and guidance that directly or indirectly provide resource oversight are summarized in this section.

- Federal Executive Order 11990: Protection of Wetlands requires agencies to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the beneficial values of wetlands.
- ESA (16 U.S.C. 1531 et. seq.) authorizes the USFS to protect plant and wildlife species and the habitats on which they depend. It requires federal agencies to ensure that their actions (including permitting) are not likely to jeopardize the continued existence of a listed species or result in the destruction of the species' habitat.
- CWA's objective is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. Individual sections of the CWA maintain and protect the nation's water resources.
- The FLPMA, as amended, consolidates and articulates the BLM and USFS management responsibilities and governs most uses of the federal lands, including authorization to grant or renew rights-of-way. The agencies must make land-use decisions based on principles of multiple use and sustained yield. As such, a grant of right-of-way must be limited to its necessary use and must contain terms and conditions that reflect the agencies' management responsibilities under FLPMA, including minimizing impacts on fish and wildlife habitat.
- Fish and Wildlife Coordination Act of 1934 is based on this act, fish and wildlife resources receive equal consideration with other resources in water resource development programs.
- Fish and Wildlife Coordination Act of 1956 (43 CFR 24.6) states that "By reason of the Congressional policy of state-federal cooperation and coordination in the area of fish and wildlife conservation, state and federal agencies have implemented cooperative agreements for a variety of fish and wildlife programs on Federal Lands." Wyoming has entered into conservation agreements with several federal agencies for the conservation and management of several sensitive species that occur in the Project area.
- The Organic Administrative Act of 1897, as amended, recognizes watersheds as systems to be managed with care, to sustain their hydrologic function.
- BLM Manual 1120 provides policy and direction regarding fish and wildlife management on BLM administered lands.
- BLM Manual 6840 provides BLM policy and direction concerning BLM Sensitive Species with Wyoming sensitive species administered under IM No. WY 2010-027 establishing the latest Wyoming Sensitive Species list.
- The Upper Colorado Endangered Fish Recovery Program: Under this program, any amount of water removed from the Colorado River system is considered to be a depletion of water, and amounts greater than 0.1 acre-feet per year require formal consultation with the USFWS for downstream impacts on threatened and endangered species.
- The Platte River Recovery Implementation Program: The objective of the program is to provide incentive-based project to provide sufficient water flow through the Platte River. The First Increment program focuses on increasing flow from 130,000 to 150,000 acre-feet per year. Additionally, federal agencies must ensure that water related projects do not harm the threatened and endangered species or adversely modify their habitats according to the ESA. Any water related construction activities that has the potential to increase water levels must be offset in accordance with Wyoming State and the USFWS "depletions plan."

3.2.3.1.1 State Regulations

- Wyoming State Code Section 23-1-101 defines 'wildlife' as all wild mammals, birds, fish, amphibians, reptiles, crustaceans and mollusks, and wild bison designated by the Wyoming Game and Fish Commission and the Wyoming Livestock Board in the state.
- Wyoming State Code Section 23-1-103 states all wildlife is the property of the State of Wyoming; and directs the control, propagation, management, protection and regulation of wildlife in the state.
- Wyoming State Code Section 23-1-302 empowers the Wyoming Game and Fish Commission to manage big game hunting seasons, take and areas in the state; and to develop, improve and maintain lands and waters for the management and protection of all wildlife.
- Wyoming Game and Fish Commission, Chapter 52, Section 9, indicates that all nongame wildlife and fish can only be taken from licensed lands and waters.
- The State Wildlife Action Plan (WGFD 2010a) is a coordinated, comprehensive conservation strategy designed to maintain the health and diversity of wildlife, including species with low and declining populations in the state of Wyoming.
- The WGFD Crucial Streams Corridors are streams of importance for fish spawning and habitat purposes.

3.2.3.2 Regional Setting

Aquatic resources and fish are categorized regionally by major watersheds and drainages. The Project area spans 2 ecoregions, Wyoming Basin and Middle Rockies, and 11 subbasins described in Table 3-47.

Table 3-47
Subbasins by Project Segment of the Study Area

Segment	Subbasin (Hydrologic Unit Code)
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant	Upper Green (14040101) Upper Green-Slate (14040103)
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect	Big Sandy (14040104) Bitter (14040105) Great Divide Closed Basin (14040200) Sweetwater (10180006) Upper Green (14040101) Upper Green-Slate (14040103)
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect	Badwater (10080006) Lower Wind (10080005) Middle North Platte-Casper (10180007) Muskrat (10080004) South Fork Powder (10090203) Sweetwater (10180006)

3.2.3.3 Fish

Two distinct fish communities are present in the Project area, cold water and warm water. Cold water communities are present in cold, well oxygenated lakes and high gradient streams with good water quality. Trout species are the dominant fish predator with smaller dace and minnow species. Warm water communities are found in warmer lakes and streams that may also be poorly oxygenated and have diminished water clarity and quality. Larger warm water fish include common carp, largemouth bass, and catfish, with smaller killifish, minnows, and suckers.

Fish communities in the study area include cold and warm water fishes. Trout species form the apex fish predators in cold water communities, whereas warm water apex species include channel catfish in larger and invertebrate preying species in smaller waterbodies. Notable non-native species include brown trout in cold water and common carp in warm water. The study area spans a major fish drainage biogeographic boundary at the Continental Divide between the Pacific Ocean with the Upper Colorado River drainages and the Atlantic Ocean with the Platte River.

Two BLM sensitive fish species, the flannelmouth sucker (*Catostomus latipinnis*) and the bluehead sucker (*Catostomus discobolus*), are known to occur where the Project would cross the Big Sandy River in Segment 2.

Trout bearing streams are found in all three segments and crossed by all alternative routes. Prominent trout bearing streams include the Green River, Big Sandy River, Sweetwater River, and numerous smaller order tributaries to these rivers. Of these trout bearing streams, Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) are known only to occur in streams located in Segment 1 (WGFD 2010b). Beaver Creek and Spring Creek contain a core conservation population of Colorado River cutthroat trout, and both are crossed by the Proposed Action and all alternative routes in Segment 1. Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*) are known to occur in Fremont County, but known distribution is limited to the eastern drainages of the Wind River Range well north of the Project study area.

Segment 1 and portions of Segment 2 of the study area are in the Upper Colorado Endangered Fish Recovery Program area that includes the Green River watershed. The USFWS Upper Colorado Endangered Fish Recovery Program includes other partnering stakeholders who are targeting four species of ESA-listed endangered fish in the Upper Colorado River Basin for recovery. The four species may occur in, or be downstream from, or are currently extirpated from the Green River portion of the study area and include the federally endangered humpback chub (*Gila cypha*), bonytail (*G. elgans*), Colorado pikeminnow (*Ptychochelius lucius*), and razorback sucker (*Xyrauchen texanus*). The program coordinates water uses with species recovery objectives in accordance with local, state, and federal requirements and water use compacts. The APE in Wyoming is defined as the Upper Colorado River at its tributaries to the headwaters. Actions with the potential to affect downstream water availability (depletions) and quality are subject to coordination with the USFWS under the ESA.

All Segment 1 alternative routes are entirely in the Upper Colorado Endangered Fish Program area and are subject to program coordination. In Segment 2, Alternatives 2A: Proposed Action and 2B: Southern Route cross the Green River watershed and are subject to program coordination.

Segment 3 occurs in the Platte River Recovery Implementation Program area. The USFWS Platte River Recovery Program targets one fish species, the pallid sturgeon, but covers several other ESA listed species including the least tern (*Sternula antillarum*), piping plover (*Charadrius melodus circumcinctus*), whooping crane (*Grus americana*), and the western prairie fringed orchid (*Platanthera praeclara*). Potential effects of the Project for all species covered in the program are entirely related to water depletions and are identical for species; thus, all species are addressed together here. All actions in the Platte River watershed that could affect downstream water availability and quality are subject to ESA coordination. The program objectives include maintaining adequate and naturally timed stream flows, particularly downstream in Nebraska. Flow management maintains in-stream channel habitat for the pallid sturgeon. All pipeline alternative routes are in the program area and will be subject to coordination with the USFWS. However, Alternative 3A: Proposed Action is the only alternative pipeline route considered that crosses a major Platte River tributary, the Sweetwater River, and associated fish habitat near Jeffrey City.

3.2.3.4 Aquatic Resources

Aquatic resources also are described in Section 3.2.20 as lotic (flowing) or lentic (ponding) surface waters. Aquatic resources associated with wetlands and riparian areas are addressed in the Wetlands and Riparian section (Section 3.2.21). Streams, rivers, lakes, ponds, and wetlands all have unique biological communities and ecosystem processes. Ephemeral intermittent waterbodies may lack fish and have ephemeral, opportunistic biological communities influenced by seasonal hydrology. Permanent waterbodies will often have fish and biological communities more typical of waterbodies with reliable, persistent hydrology. Regardless, Wyoming's status as an arid state places a premium on water resources. Despite the lack of relative abundance on the land surface, aquatic resources provide important habitat and ecological functions for upland and aquatic species.

Aquatic resources described in this section include Wyoming Game and Fish Crucial Streams, Blue and Red Ribbon Trout Streams, and Aquatic Conservation Areas.

3.2.3.4.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

In Segment 1 there are 30 reaches of the Green River classified as WGFD Crucial Streams for aquatic species. Table 3-48 shows the specific Green River reaches by HUC 14 codes.

Table 3-48
Crucial Stream Reach Codes of the Green River Located in Segment 1

Green River Crucial Stream Reach Code (Hydrologic Unit Code 14)		
14040101000019	14040101001336	14040101006235
14040101000020	14040101001338	14040101006237
14040101000023	14040101002460	14040101006238
14040101000025	14040101002757	14040101006306
14040101000026	14040101002877	14040101006307
14040101000028	14040101002879	14040101006308
14040101000031	14040101002880	14040101006309
14040101000942	14040101002884	14040101007067
14040101001316	14040101002965	14040101007102
14040101001332	14040101003433	

The Green River is the only WGFD red ribbon stream in Segment 1. No blue ribbon trout streams occur in Segment 1. Additionally, two WGFD aquatic conservation areas occur in Segment 1: Green River-Beaver Creek (HUC 1404010108) and Birch Creek-Green River (1404010110). All alternative routes cross both aquatic conservation areas in Segment 1. Additionally, all alternative routes cross the WGFD aquatic crucial priority area, Trail Ridge-Upper Beaver Watershed, where the Project would cross Beaver Creek.

Segment 1 is located entirely in the Upper Colorado Endangered Fish Recovery Program APE that includes the Green River. All pipeline alternative routes considered in Segment 1 cross the Green River.

3.2.3.4.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Segment 2 includes three reaches of the Big Sandy River classified as Wyoming Game and Fish crucial streams for aquatic species. Segment 2 Big Sandy River Crucial Stream segments are shown in Table 3-49 using HUC 14 reach codes.

Table 3-49 Crucial Stream Reach Codes Located in Segment 2	
Stream/River	**Crucial Stream Reach Code (Hydrologic Unit Code 14)**
Big Sandy River	14040104000179 14040104003112 14040104000178

No WGFD red or blue ribbon trout streams are in Segment 2. Three WGFD aquatic conservation areas are in Segment 2: Birch Creek-Green River (HUC 1404010110), Little Sandy Creek/Pacific Creek (HUC 1404010402), and Upper Big Sandy River (HUC 1404010401). The Upper Big Sandy River aquatic conservation area is also a WGFD aquatic crucial priority area. Both the Proposed Action and Alternative 2B: Southern Route cross the Birch Creek-Green River aquatic conservation area, but only the Proposed Action crosses the Little Sandy Creek/Pacific Creek and Upper Big Sandy River conservation areas.

Alternatives 2A: Proposed Action and 2B: Southern Route cross the Green River watershed and are subject to coordination under the Upper Colorado Endangered Fish Recovery Program.

3.2.3.4.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

No WGFD Crucial Streams are in Segment 3. No red or blue ribbon streams and no aquatic conservation areas are in Segment 3.

All pipeline alternative routes are in the Platte River Recovery Implementation Program area and will be subject to coordination with the USFWS. All alternative routes considered in Segment 3 cross a major Platte River tributary, the Sweetwater River, and associated fish habitat near Jeffrey City.

3.2.4 Geology and Topography

This section describes the existing conditions of earth resources, including mineral resources, in the study corridors for the Project.

3.2.4.1 Regulatory Framework

NEPA and FLPMA serve as the primary legislation requiring assessment and mitigation of potential impacts on mineral and soil resources. In addition to the requirements of NEPA and FLPMA, the Farmland Protection Act of 1981 requires the assessment of impacts on designated farmland soils from proposed conversion of farmlands to nonagricultural uses.

3.2.4.2 Regional Setting

The Project lies almost entirely in the Wyoming Basin Physiographic Province (Fenneman 1928). The Wyoming Basin is characterized by rolling hills, plateaus, and isolated mountain ranges, and generally occupies most of southwest Wyoming. The proposed Project begins on the western edge of the Wyoming Basin at the base of the Wyoming Range that forms the boundary of the Middle Rocky Mountains Province in western Wyoming. The western portion of the proposed Project from Riley Ridge to the southeastern corner of Fremont County would cross the Greater Green River Basin, a structural and topographic basin which occupies most of the Wyoming Basin province. From the southeastern corner of Fremont County, the Project proceeds north and northeast over the Green Mountains, and then over the low relief Granite Mountains. From there the Project would cross the Beaver Divide, skirting the Rattlesnake Hills. The Project terminates at Powder River, Wyoming, which is in the Wind River Basin (SWCA 2014b).

3.2.4.3 Mineral Resources

The Project lies mostly in the Greater Green River Basin, but does extend across the Beaver Divide, in southeastern Fremont County, into a portion of the Wind River Basin. Both the Greater Green River and Wind River basins are two of several "Laramide Basins" in Wyoming. Laramide basins were formed during the Cretaceous/Tertiary Laramide orogeny. Large deposits of shale are known to occur in the Green River Formation, which constitutes a major portion of Tertiary sedimentary rocks in the Greater Green River Basin (Murphey and Daitch 2007). Other hydrocarbon source rocks include the Phosphoria Formation, Mowry/Aspen Shale, Hiliard/Baxter Shale, Niobrara Formation, Mesaverde Group, Lewis Shale, Lance and Fort Union formations, Wasatch and Fort Union formations (WSGS 2014a). There are an estimated 283 producing fields in the Greater Green River Basin, 252 of which have produced oil and 267 have produced gas (WSGS 2014a). The Greater Green River Basin also has Wyoming's largest, naturally occurring accumulation of CO_2. These occur along the Moxa Arch and Rock Springs uplift (Lynds 2013). In the Wind River Basin hydrocarbon source rocks include the Phosphoria, Park City and Goose Egg Formations, Mesaverde Group, Frontier Formation, and Muddy Sandstone (WSGS 2014b).

3.2.4.4 Physiography and Geology

3.2.4.4.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Segment 1 lies almost entirely in the Wyoming Basin Physiographic Province (Fenneman 1928). The Wyoming Basin consists of mountain ranges, valley floors and basins, and plateaus. The Project begins at the Riley Ridge Treatment Plan near the boundary of the Middle Rocky Mountains Province and the Wyoming Basin Province, and then continues southeast to the Riley Ridge Sweetening Plant. Segment 1 also crosses the Green River Structural Basin, which is part of the Wyoming Basin Physiographic Province. This portion of the Green River Structural Basin is demarcated by the Wind River Thrust to the northeast and the Darby Thrust and Moxa Arch to the south and southeast. In this area, Segment 1 is almost entirely in the Green River Basin, one of several subbasins in the Greater Green River Basin (Roehler 1991, Murphey and Daitch 2007). Here, Segment 1 crosses nine different geological units from the Paleozoic and Cenozoic Eras. These include Pleistocene alluvium and colluvium, several members of the Green River and Wasatch formations, and limestone and dolomite deposits from the Paleozoic. The association of these units is displayed in Table 3-50 and summarized in Table 3-51. Because of the number of geological units in the Project area and the complex association of some of these units, a map has been generated (refer to Map Volume) showing the units by era and rock type (volcanic, sedimentary, and metamorphic).

Table 3-50
General Diagram Showing Relationships of Geological Units in Segment 1

Quaternary Deposits (Qa and Qt)	
Laney Shale Member of Green River Formation (Tgl)	Green River and Wasatch Formations (Tgrw)
New York Tongue of Wasatch Formation and Fontenelle Tongue of the Green River (Twg)	
La Barge and Chappo Members of Wasatch Formation (Twlc)	Diamictite and Sandstone of Wasatch Formation (Twd)
Hiatus	
Darby Formation (MD)	
Middle Cambrian-Upper Ordovician Limestone and Dolmite (O)	

Table 3-51
Geologic Units Crossed by the Project

Age	Geologic Unit	Symbol
Segment 1		
Pleistocene/Holocene	Alluvium and Colluvium	Qa
Pleistocene/Holocene	Gravel, Pediment, and Fan Deposits	Qt
Eocene	Laney Shale Member of Green River Formation	Tgl
Eocene	New York Tongue of the Wasatch Formation and Fontenelle Tongue of the Green River	Twg
Eocene	Green River and Wasatch Formations	Tgrw
Eocene	La Barge and Chappo Members of the Wasatch Formation	Twlc
Eocene	Diamictite and Sandstone of Wasatch Formation	Twd
Devonian-Mississippian	Darby Formation	MD
Cambrian-Ordovician	Middle Cambrian-Upper Ordovician Limestone and Dolomite	O_
Segment 2		
Pleistocene/Holocene	Alluvium and Colluvium	Qa
Pleistocene/Holocene	Dune Sand and Loess	Qs
Pleistocene/Holocene	Playa Lake and Other Lacustrine Deposits	Ql
Pleistocene/Holocene	Alkalic Volcanic Rock	Qi
Pleistocene/Holocene	Gravel, Pediment and Fan Deposits	Qt
Miocene	Browns Park Formation/Miocene Rocks	Tm
Oligocene	White River Group	Twr
Eocene	Laney Shale Member of Green River Formation	Tgl
Eocene	Fontenelle Tongue of Green River Formation	Twg
Eocene	Tipton Shale Member or Tongue of Green River Formation	Tgt
Eocene	Wilkins Peak Member of Green River Formation	Tgw
Eocene	Wilkins Peak Member and Tipton Shale Member or Tongue of Green River Formation	Tgwt
Eocene	Cathedral Bluffs Tongue of Wasatch Formation	Twc
Eocene	Bridger Formation	Tb
Eocene	Crooks Gap Conglomerate	Tcg
Eocene	Transition Between Battle Spring Formation and Wasatch Formation	Tbw
Paleocene/Eocene	Battle Spring Formation	Tbs
Paleocene/Eocene	Main Body of Wasatch Formation	Twm
Paleocene	Fort Union Formation	Tfu
Cretaceous	Almond Formation of Mesaverde Group	Kal
Segment 3		
Pleistocene/Holocene	Alluvium and Colluvium	Qa
Pleistocene/Holocene	Dune Sand and Loess	Qs
Miocene	Miocene Rocks	Tm
Oligocene	White River Formation	Twr
Eocene	Wind River Formation	Twdr
Paleocene/Eocene	Battle Spring Formation	Tbs
Paleocene	Fort Union Formation	Tfu
Cretaceous	Lance Formation	Kl
Cretaceous	Lance Formation, Fox Hills Sandstone, Meeteetse Formation, Bearpaw and Lewis Shales	Klm
Cretaceous	Frontier Formation	Kf
Cretaceous	Meeteetse Formation and Lewis Shale	Kml
Cretaceous	Mesaverde Formation or Group	Kmv
Cretaceous	Cody Shale	Kc
Cretaceous	Mowry and Thermopolis Shales	Kmt

Table 3-51 Geologic Units Crossed by the Project		
Age	**Geologic Unit**	**Symbol**
Jurassic/Cretaceous	Cloverly, Morrison, and Sundance Formations	KJs
Triassic	Chugwater and Dinwoody Formations	@cd
Proterozoic	Granitic Rocks	Wg
Proterozoic	Metasedimentary and Metavolcanic Rocks	WVsv

The two injection well sites are included in a proposed 80-acre area as part of the Riley Ridge Sweetening Plant site. The well pads for these injections wells will be approximately 3.9 acres in size. The injection wells will be drilled to approximately 20,000 feet and will intersect several different geological units. A diagram of the proposed injection wells is shown in Figure 2-1.

3.2.4.4.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Segment 2 crosses the Green River Basin and the Great Divide Basin that are part of the larger Greater Green River Basin. Segment 2 skirts south of Wind River Mountains. This larger segment crosses 23 geological units of the Mesozoic and Cenozoic Eras. These include Quaternary alluvium, playa, dune sand, volcanic rock, and other unconsolidated deposits, Bridger Formation, Battle Spring Formation, Crooks Gap Conglomerate, Fort Union Formation, Browns Park Formation, White River Group, and several members of the Green River and Wasatch Formations, Mesaverde Group, Fox Hills Formation, Landslide Creek Formation, and Lewis Shale. The association of these units is displayed in Table 3-52.

Table 3-52 General Diagram Showing Relationships of Geological Units in Segment 2		
Quaternary Deposits (Qa, Qt, Ql, Qi, and Qs)		
Miocene Rocks/Browns Park Formation (Tm)		
White River Group (Twr)		
Bridger Formation (Tb)	Crooks Gap Conglomerate (Tcg)	
Laney Shale Member of Green River Formation (Tgl)		
Wilkins Peak Member of Green River Formation (Tgw)		
Fontenelle Tongue of the Green River (Twg)	Tipton Shale Member of Green River Formation (Tgt)	
Main Body of Wasatch Formation (Twm)	Transition Between Battle Spring Formation and Wasatch Formation (Tbw)	Battle Spring Formation (Tbs)
Fort Union Formation (Tfu)		
Hiatus		
Almond Formation of Mesaverde Group (Kal)		

3.2.4.4.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Segment 3 mostly lies in the Wyoming Basin as the Project heads north through the Granite Mountain area before turning east, north of Rattlesnake Hills. The final portion of this segment crosses into the southeastern extent of the Wind River Basin. Segment 3 crosses 23 geologic units from the Paleozoic, Mesozoic, and Cenozoic Eras. These include Quaternary alluvium, landslide, dune sand and other unconsolidated deposits, Battle Springs Formation, Crooks Gap Conglomerate, Fort Union Formation, Browns Park Formation, Wagon Bed Formation, Wind River Formation, White River Group, Cody Shale, Frontier Formation, Sundance Formation, Landslide Creek Formation, Lewis Shale, Meeteetse Formation, Mowry and Thermopolis shales, Mesaverde Group, Chugwater Group, Goose Egg Formation, and Paleozoic granitic and metasedimentary rocks. The association of these units is displayed in Table 3-53.

Table 3-53 General Diagram Showing Relationships of Geological Units in Segment 3	
Quaternary Deposits (Qa, and Qs)	
Miocene Rocks/Browns Park Formation (Tm)	
White River Group (Twr)	
Wind River Formation (Twdr)	
Battle Spring Formation (Tbs)	
Fort Union Formation (Tfu)	
Lance Formation (Kl)	
Lance Formation, Fox Hills Sandstone, Meeteetse Formation, Bearpaw and Lewis Shales (Klm)	
Meeteetse Formation and Lewis Shale (Kml)	
Mesaverde Group (Kmv)	
Almond Formation of Mesaverde Group (Kal)	
Cody Shale (Kc)	
Frontier Formation (Kf)	
Mowry and Thermopolis Shales (Kmt)	
Cloverly, Morrison, and Sundance Formations (KJs)	
Chugwater and Dinwoody Formations (@cd)	
Granitic Rocks (Wg)	Metasedimentary and Metavolcanic Rocks (WVsv)

3.2.4.5 Mineral Resources

Areas with active mining claims, mineral material sites, oil and gas leases, coal leases, and geothermal leases in the study corridors were identified using the BLM and USFS Geocommunicator and LR2000 database. Additional information pertaining to mineral resources was obtained from other federal and state sources, including the USGS and WSGS. MV-2 illustrates these mineral resources.

3.2.4.5.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Segment 1 lies at the western edge of The Green River Structural Basin. The Green River Basin is well known for its oil shale deposits (Murphey and Daitch 2007). 32 oil and gas leases were identified in Segment 1 with 1,280 wells. One sand and gravel mine (Dry Piney Pit) was also identified in Segment 1. The Dry Piney Pit has an approximate area of 575 feet by 430 feet.

3.2.4.5.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

There were 49 oil and gas leases identified in Segment 2 with 131 wells. In Segment 2 there are 11 mines identified. These included uranium, potassium, sodium carbonate, and sand and gravel mines. Most of the mines identified have little or no data available as to their size. Sand and gravel pits are typically small.

3.2.4.5.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

There are 41 oil and gas leases identified in Segment 3 with 439 wells. 146 mines were identified in the study corridors for Segment 3. Most of these are labeled as occurrences or past producers of uranium. Other mines in Segment 3 are for gold, molybdenum, corundum, and mica. Most of the mines identified have little or no data available as to their size. Sand and gravel pits are typically small. The Split Rock Mine near Jeffrey City consists of 180 acres of mine tailings. Another closed uranium mine south of Jeffrey City has an approximate footprint of 3,660 feet by 2,600 feet.

3.2.4.6 Geological Hazards

Information regarding geologic hazards was obtained from the scientific literature and discussions with resource specialists at the BLM. Data used for the geology and geological hazards was obtained from the USGS, WSGS, and the BLM. Geological units in the Project area were identified from the state geological map (Green and Drouilard 1994).

3.2.4.6.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

For Segment 1 geological hazards include two previously documented earthquake epicenters both of which occurred in 1971 having magnitudes of 3.6 and 4.1. Earthquakes of these magnitudes can usually be felt, but rarely cause damage. No quaternary faults are present in Segment 1. There are 10 previously documented landslide areas identified in Segment 1, most of which occur at the beginning of Segment 1 just east of Deadline Ridge. These landslides are mostly debris flows or slumps. Debris flows are usually caused by intense surface-water flow that mobilizes loose soil or rock and are commonly found on steep slopes or gullies (USGS 2004). The most damaging types of landslides are those associated with intense rainfall or snowmelt or volcanic or seismic activity.

3.2.4.6.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

No previously documented earthquakes or faults were identified in Segment 1. There are nine landslide areas in Segment 2. These landslides are mostly multiple block slides and multiple slides. The area between MPs 99 and 100 was identified in the Geology Resource Report as being a landslide area that would be crossed by the Project (SWCA 2014b). Another area with several small landslides, previously reported, in the study area occur at the end of Segment 2 and beginning of Segment 3 in the southeastern corner of Fremont County between the Green and Crooks mountains.

3.2.4.6.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

One previously reported earthquake epicenter was identified in Segment 3. This earthquake occurred in 1975 and had a magnitude of 3.5. One normal fault and one thrust fault were identified in Segment 3. These faults are considered non-active. Eight previously documented landslides were identified in Segment 3. These are mostly small multiple block slides and multiple debris flows associated with the Green and Crooks mountains.

3.2.5 Lands and Realty

Land-use resources include existing land use, future land use, and authorized projects. Land-use resources were identified and evaluated for all jurisdictions occurring in the 2-mile-wide study corridors. The affected environment for lands with wilderness characteristics, livestock grazing, recreation, special designations, travel management, and wild horses and burros will be discussed in Sections 3.2.6, 3.2.10, 3.2.13, 3.2.16, 3.2.17, and 3.2.21, respectively. A resource report prepared by the Applicant (SWCA 2014c) was used as the basis for this inventory, and updated and supplemented with the BLM and secondary source GIS spatial data and aerial photo interpretation.

3.2.5.1 Regulatory Framework

BLM-administered lands occurring in the Project area are managed by direction provided in the RMPs that establish the goals and objectives for the management of resources. Approved management plans and their amendments relevant to the Project area are listed below and in Section 1.6.2.

- BLM Casper Field Office RMP, 2007
- BLM Lander Field Office RMP, 2014
- BLM Pinedale Field Office RMP, 2008
- BLM Rawlins Field Office RMP, 2008
- BLM Rock Springs Office Green River RMP, 1997
- Fremont County Land Use Plan, 2004
- Natrona County Development Plan, 1998
- Sublette County Comprehensive Plan, 2003 (Amended 2005)
- Sublette County Federal and State Land Use Policy Plan, 2009
- Sublette County Conservation District Long Range Use Plan, 2014
- Sweetwater County Comprehensive Land Use Plan, 2002
- Sweetwater County Conservation Land and Resource Use Plan and Policy, 2011

Wyoming does not have a comprehensive plan. The Wyoming Office of State Lands and Investments manages Wyoming Trust Lands

3.2.5.2 Regional Setting

The Project extends from Riley Ridge near Big Piney in Sublette County to the Natrona Hub near Powder River in Natrona County. Alternative routes cross Sublette, Sweetwater, Fremont, and Natrona counties. The 2-mile-wide study corridors includes a diverse landscape with rural residential, open rangeland, agricultural and recreational land uses, as well as industrial, mining, oil and gas, and energy development.

3.2.5.3 Land Jurisdiction and Utility Corridors

3.2.5.3.1 Land Jurisdiction

Land jurisdiction in the study area consists of federal and state land-management agencies and private lands. Land jurisdiction in the study corridors is listed in Table 3-54, Table 3-55, and Table 3-56 by segment below.

3.2.5.3.2 Utility Corridors

There are two types of designated utility corridor in the 2-mile-wide study corridor: BLM-designated RMP corridors and DOE West-wide Energy Corridors. Refer to Map 4-1 and Table 3-54, Table 3-55, and Table 3-56 for further detail on the presence of utility corridors by segment.

3.2.5.3.2.1 Bureau of Land Management Designated Utility Corridors

The BLM has utility corridors designated in their related RMPs. In the Project study area, the BLM has designated corridors in the Lander and Casper Field Offices. There are various types of designations for these corridors, including overhead utilities only, underground utilities only, and overhead and underground utilities. These corridors are shown on Map 4-1.

3.2.5.3.2.2 Department of Energy West-Wide Energy Corridors

As directed by Congress in Section 368 of Energy Policy Act of 2005, codified in 42 U.S.C 15926[1], participating agencies examined the energy infrastructure issues in the West designated energy corridors on federal land for oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities in 11 western states (including Wyoming).

[1] P.L. 109-58, title III, §368, Aug. 8, 2005, 119 Stat. 727.

Several agencies amended their respective land-use management plans or similar land-use plans, as appropriate, to include the designated energy corridors on land administered by their agency, if designated corridors occur on those lands.

In July 2012, the Obama administration agreed to settle a 2009 lawsuit against the Departments of Interior, Agriculture, and Energy filed in the U.S. District Court for the Northern District of California by 15 plaintiffs regarding the DOE West-Wide Energy Corridors. The lawsuit claimed that the utility corridors encouraged coal- fired power in the West and, in several areas, ignored or underserved renewable energy resources (DOE and BLM 2008).

The settlement requires the BLM, USFS, and DOE to locate corridords in favorable landscapes to facilitate renewable energy, avoid environmentally sensitive areas, and prevent a dense web of transmission and pipeline infrastructure. The settlement gives the BLM the authority to reassess the corridors and revise, delete, or potentially add new corridors. Specific corridors outlined in the settlement have environmental concerns identified by conservation groups (hereafter referred to as corridors of concern). These corridors are shown on Map 4-1.

3.2.5.3.3 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

The BLM owns approximately 79 percent of land crossed by the 2-mile-wide study corridors in Segment 1 (Table 3-54). The state of Wyoming owns approximately 6 percent and private land ownership accounts for approximately 14 percent of the Segment 1 study corridors. Less than 1 percent of lands in Segment 1 are owned by other entities.

Table 3-54
Land Jurisdiction and Utility Corridors in the 2-Mile-Wide Study Corridors in Segment 1

Land Jurisdiction		Utility Corridors
Entity	**Acres**	**BLM Designated Utility Corridors or West-Wide Energy Corridors**
BLM	60,878.1	There are no BLM designated utility corridors or West-Wide Energy Corridors present in Segment 1.
State of Wyoming	4,670.8	
Private Ownership	10,859.9	
Other	409.2	
Total	76,818.0	

SOURCE: DOE and BLM 2008
NOTE: [1]Acreage rounded to the nearest tenth

3.2.5.3.4 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

The BLM owns approximately 91 percent of land crossed by the 2-mile-wide study corridors in Segment 2 (Table 3-55). The state of Wyoming owns approximately 3 percent and private land ownership accounts for approximately 4 percent of the Segment 2 study corridors. Less than 1 percent of lands crossed by Segment 2 are owned by the U.S. Bureau of Reclamation.

Table 3-55 Land Jurisdiction and Utility Corridors in the 2-Mile-Wide Study Corridors in Segment 2		
Land Jurisdiction		**Utility Corridors**
Entity	**Acres**	**BLM Designated Utility Corridors or West-Wide Energy Corridors**
BLM	253,308.8	Utility corridors located in Segment 2 include (refer to Section 4.3.5 for further detail): ▪ Bairoil (below ground, Lander Field Office) ▪ Bison Basin (below ground, Lander Field Office) ▪ Frontier (below ground, Lander Field Office) ▪ Lost Creek (overhead or below ground, Lander Field Office) ▪ West-Wide Energy Corridor 121-221
Bureau of Reclamation	443.4	
State of Wyoming	11,090.8	
Private Ownership	13,481.1	
Total	278,324.1	
SOURCE: DOE and BLM 2008 NOTE: [1]Acreage rounded to the nearest tenth		

3.2.5.3.5 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

The BLM owns approximately 50 percent of land crossed by the 2-mile-wide study corridors in Segment 3 (Table 3-56). The state of Wyoming owns approximately 11 percent and private land ownership accounts for approximately 38 percent of the Segment 3 study corridors. Less than 1 percent of lands in Segment 3 are owned by other entities.

Table 3-56 Land Jurisdiction and Utility Corridors in the 2-Mile-Wide Study Corridors in Segment 3		
Land Jurisdiction		**Utility Corridors**
Entity	**Acres**	**BLM Designated Utility Corridors or West-Wide Energy Corridors**
BLM	102,263	Utility corridors located in Segment 3 include (refer to Section 4.3.5 for further detail): ▪ Bairoil (below ground, Lander Field Office) ▪ Black Rock (below ground, Lander Field Office) ▪ Frontier (below ground, Lander Field Office) ▪ Highway 20/26 (overhead or below ground, Lander Field Office) ▪ Lost Creek (overhead or below ground, Lander Field Office) ▪ PacifiCorp East-West (overhead or below ground, Lander Field Office) ▪ Sand Draw (below-ground, Lander Field Office) ▪ Sand Draw to Casper (overhead or below ground, Lander Field Office) ▪ D6067 6068 and Cabin Creek utility corridors (Casper Field Office) ▪ There are no West-Wide Energy Corridors present in Segment 3.
State of Wyoming	21,408	
Private Ownership	77,474	
Other	87	
Total	201,233	
SOURCE: DOE and BLM 2008 NOTE: [1]Acreage rounded to the nearest acre		

3.2.5.4 Existing Land Use, Authorized Projects, and Future Land Use

This section identifies the existing, authorized, and future land uses located in the Project area by segment, including mineral and energy development.

3.2.5.4.1 Existing Land Use

Existing land use includes general developed land use, utilities, mineral development, and realty authorizations. General developed land-use types were determined using land-use classifications from the USGS National Gap Analysis Program (GAP) landcover data. Land-use types were categorized into six

classes: barren ground, developed, forest/woodlands, grassland, shrubland, and wetland/riparian/open water. Utilities were inventoried using BLM and secondary source GIS spatial data. Realty authorizations were inventoried using BLM GIS spatial data.

Many mineral and mining operations are in the 2-mile-wide study corridors. The main types of mining are fluid extraction (oil and gas) and solid mineral extraction (mineral materials, leasables, and locatables). Examples of mineral materials include sand and gravel; leasables include sodium and coal; locatables include uranium and gold.

Fluid extraction occurs throughout the study corridors with large authorized oil and gas leases occurring in central Wyoming.

Mineral materials in the study corridors are used for the construction of roads, highways, and commercial and residential development. The BLM has active contracts for private extraction of sand, gravel, and building stone, as well as free-use permits (agreements between government and nonprofit organizations to extract and use mineral materials for nonindustrial and commercial purposes) with state and local governments.

3.2.5.4.1.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Table 3-57 lists the types of existing land uses in the 2-mile-wide study corridors in Segment 1 that could potentially be affected by the Project and alternative routes.

Table 3-57
Existing Land Use for Segments 1, 2, and 3

Type	Description
Barren Ground	Encompasses barren, sparsely vegetated (e.g., less than 10 percent cover) areas.
Developed	Developed land is considered to be any land that is currently disturbed by industrial use, an active right-of-way for utilities or transportation, agriculture, or identified as urban (which may include residential areas).
Forest/Woodlands	Encompasses vegetation types of alpine, aspen, limber pine/juniper, and montane forests.
Grassland	Encompasses grassland vegetation covered areas.
Shrubland	Encompasses shrubland vegetation covered areas.
Wetland/Riparian/Open water	Includes riparian and wetland habitat areas and open waters.

Table 3-56 lists the major utilities in the 2-mile-wide study corridors in Segment 1 that could potentially be affected by the Project and alternative routes.

Table 3-58
Major Utilities in the 2-Mile-Wide Study Corridors for Segment 1

Utility Type	In the 2-Mile-Wide Study Corridor
Transmission Lines	▪ The first 8.2 miles of the proposed pipeline parallels a 230kV transmission line. Alternative 1C: Figure Four would parallel a 69kV transmission line for approximately 7 miles and a 230kV transmission line for 9 miles.
Pipelines	▪ Five natural gas pipelines owned or operated by one of the following: Williams Field Services, QEP, FMC Wyoming[1] ▪ One condensate pipeline owned or operated by Ultra[1]
Communication Facilities	▪ No communication facilities are present within the 2-mile-wide study corridors
Compressor Pump Stations	▪ Three compressor pump stations owned or operated by Williams Field Services[1]
NOTE: [1]Based on pipeline and compressor pump station data received from the BLM Casper Field Office (statewide data) and Wyoming Pipeline Authority (WPA). Local field knowledge indicates there are other pipelines and other oil and gas infrastructure in this area and ownership may differ from what is disclosed here.	

3.2.5.4.1.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Existing land uses occurring in Segment 2 are listed in Table 3-57. Table 3-59 lists the major utilities in the 2-mile-wide study corridors in Segment 2 that could potentially be affected by the Project and alternative routes.

Table 3-59
Major Utilities in the 2-Mile-Wide Study Corridors for Segment 2

Utility Type	In the 2-Mile-Wide Study Corridor
Transmission Lines	▪ Two 230kV transmission lines
Existing Pipelines	▪ One crude oil pipeline owned or operated by Rocky Mountain Pipeline System, LLC ▪ One condensate pipeline owned or operated by Ultra[1] ▪ Five CO_2 pipelines owned or operated by ExxonMobil, Mountain Gas Resources, Merit Energy CO_2, Anadarko, or Devon Energy
Communication Facilities	▪ No communication facilities are present within the 2-mile-wide study corridors
Compressor Pump Stations	▪ No compressor pump stations are present within the 2-mile-wide study corridors[1]

NOTE: [1]Based on pipeline and compressor pump station data received from the BLM Casper Field Office (statewide data) and WPA. Local field knowledge indicates there are other pipelines and other oil and gas infrastructure in this area and ownership may differ from what is disclosed here.

3.2.5.4.1.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Existing land uses occurring in Segment 3 are listed in Table 3-57. Table 3-60 lists the major utilities in the 2-mile-wide study corridors in Segment 3 that could potentially be affected by the Project and alternative routes.

Table 3-60
Major Utilities in the 2-Mile-Wide Study Corridors for Segment 3

Utility Type	In the 2-Mile-Wide Study Corridor
Transmission Lines	▪ Three 115kV transmission lines ▪ Two 230kV transmission lines
Pipelines	▪ Thirty-two natural gas pipelines owned or operated by Colorado Interstate Gas, SG, Kansas-Nebraska Interstate, Kmigt, ConocoPhillips, Northern Gas Company, or Burlington Resources[1] ▪ One crude oil pipeline owned or operated by Express Sponsors, Amoco, Red Butte Pipeline, or Rocky Mountain Pipeline System, LLC[1] ▪ Five CO_2 pipelines owned or operated by Exxon, GPC, Anadarko, Devon Energy, or ExxonMobil[1]
Communication Facilities	▪ Three met towers
Compressor Pump Stations	▪ Four compressor pump stations owned or operated by Encana, El Paso, or Lost Creek Gathering[1]

NOTE: [1]Based on pipeline and compressor pump station data received from the BLM Casper Field Office (statewide data) and WPA. Local field knowledge indicates there are other pipelines and other oil and gas infrastructure in this area and ownership may differ from what is disclosed here.

3.2.5.4.2 Authorized Projects

Authorized projects are projects that have been permitted and approved but have not yet been built. This information was inventoried using the BLM LR 2000 data for Wyoming and includes various types of rights-of-way authorizations and uses.

3.2.5.4.2.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

The following types of authorized projects are present in Segment 1:

- federal highways
- material sites
- Rands Butte Gas Development Project
- rights-of-way for:
  - communication sites
  - irrigation facilities
  - oil and gas facility sites and pipelines
  - roads (federal and other)
  - salt water disposal and water facilities
  - power transmission and facilities
  - telephone and telegraph
  - other/miscellaneous/special for fiber optic, non-energy, oil and gas, and other energy

3.2.5.4.2.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

The following types of authorized projects are present in Segment 2:

- federal highways and rights-of-way for oil and gas facility sites and pipelines
- other federal facilities
- roads (federal and other)
- water facilities (federal and other)
- power transmission and power facilities for fiber optic, non-energy, oil and gas, other energy, and CO_2

3.2.5.4.2.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

The following types of authorized projects are present in Segment 3:

- federal highways
- tram and log roads on public land
- railroad and stations
- rights-of-way for:
  - temporary-use permits
  - communication sites
  - irrigation facilities
  - oil and gas facility sites and pipelines
  - roads
  - salt water disposal and water facilities
  - power transmission lines, generation, and facilities
  - telephone and telegraph
  - other facilities for fiber optic, non-energy, oil and gas, other energy, CO_2, and interstate energy

3.2.5.4.3 Future Land Use

Future land uses in the 2-mile-wide study corridors were identified by reviewing agency proposed project lists, as well as information provided by agencies

3.2.5.4.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

The following types of future land uses are present in Segment 1: rights-of-way for roads and oil and gas pipelines. In general, these are facilities for non-energy, oil and gas, and other energy. Other future projects include the Normally Pressured Lance Natural Gas Development Project Riley Ridge Unit Development Project, Dry Piney Deep Project, and the Bird Canyon Infill Project.

3.2.5.4.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

The following types of future land uses are present in Segment 2: rights-of-way for roads and oil and gas pipelines and facilities. In general, these are facilities for non-energy, oil and gas, and other energy. Other future projects include the Normally Pressured Lance Natural Gas Development Project.

3.2.5.4.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

The following types of future land uses are present in Segment 3: rights-of-way for communications sites; oil and gas pipelines and facility sites; other; power lines; and water facilities. In general, these are facilities for non-energy, oil and gas, other energy, and wind energy. Other future projects include Moneta Divide Natural Gas and Oil Development Project and the Sheep Mountain Uranium Project.

3.2.6 Livestock Grazing

This section examines the existing livestock grazing conditions within the 2-mile-wide study corridors for the Proposed Action and alternative routes by segment. A resource report prepared by the Applicant (SWCA 2014c) was used as the basis for this inventory, and updated and supplemented with BLM and secondary source GIS spatial data and aerial photo interpretation.

3.2.6.1 Regulatory Framework

The Taylor Grazing Act of 1934 provides the basis for the BLM to provide public land for livestock grazing. The BLM administers and manages livestock grazing through permits and leases issued to qualified applicants, and the extent of grazing allowed on BLM-administered lands can be affected by factors such as drought, wildfire, and market conditions. The BLM's overall objective in managing livestock grazing on public rangelands is to "…ensure the long-term health and productivity of these lands and to create multiple environmental benefits..." The BLM achieves this objective through the use of "rangeland health standards and guidelines" which "…describe specific *conditions* needed for public land health…" The development and application of these standards and guidelines are to achieve the four fundamentals of rangeland and health, including:

> a) Watersheds are in, or are making significant progress toward, properly functioning physical condition, including their upland, riparian wetland, and aquatic components; soil and plant conditions support infiltration, soil moisture storage, and the release of water that is in balance with climate and landform and maintain or improve water quality, water quantity, and timing and duration of flow.

b) Ecological processes, including the hydrologic cycle, nutrient cycle, and energy flow, are maintained, or there is significant progress toward their attainment, in order to support healthy biotic populations and communities.

c) Water quality complies with state water quality standards and achieves, or is making significant progress toward achieving, established BLM management objectives, such as meeting wildlife needs.

d) Habitats are, or are making significant progress toward being, restored or maintained for federal threatened and endangered species, federal proposed or candidate threatened and endangered species, federal proposed or candidate threatened and endangered species, and other special status species.

The standards to carry out the Fundamentals of Rangeland Health are as follows:

1) Upland soils exhibit permeability and infiltration rates that sustain or improve site productivity, considering the soil type, climate, and landform.

2) Riparian and wetland areas are in properly functioning condition. Stream channel morphology and functions are appropriate to soil type, climate, and landform.

3) Desired species, including native, threatened, endangered, and special status species, are maintained at a level appropriate for the site and species involved.

4) BLM will apply and comply with water quality standards established by Utah (R.317-2) and the Federal Clean Water and Safe Drinking Water Acts. Activities on BLM Lands will fully support the designated beneficial uses described in the Utah Water Quality Standards (R.317-2) for surface and groundwater.

The grazing administration program includes the issuing of permits, leases, and annual grazing licenses; billings and collections of grazing fees; inspections to verify that permittees and lessees are in compliance with the terms and conditions of their permits; leases, authorizations, and federal regulations; preparing land-use and activity plans; identifying and planning rangeland improvement projects; obtaining livestock management agreements; reviewing base property for compliance; conducting vegetative monitoring studies; and evaluating whether grazing management is achieving objectives (BLM 2004b).

The CFR, BLM manuals and manual handbooks, IMs, Information Bulletins, and the Interior Board of Land Appeal orders and decisions further guide the BLM's grazing administration program. The regulations that govern grazing administration (excluding Alaska) are contained in 43 CFR Part 4100 Grazing Administration—Exclusive of Alaska. The laws listed below are administered by the BLM through land-use planning efforts that include inventorying and monitoring of all uses on public rangelands. The BLM is responsible for monitoring and maintaining rangeland health for public use.

- The Secretary shall, by regulation or otherwise, take any action necessary to prevent unnecessary or undue degradation of the lands, FLPMA, U.S.C. 1732(b).
- The goal of (public rangeland) management shall be to improve the range conditions so that they become as productive as feasible, Public Rangelands Improvement Act, 43 U.S.C. 1903(b).
- Do any and all things necessary to stop injury to the public grazing lands by preventing overgrazing and soil deterioration and provide for the orderly use, improvement, and development of the public range, Taylor Grazing Act, 43 U.S.C. 315a and 48 Stat. 1269.

3.2.6.2 Regional Setting

Wyoming rangelands support a variety of uses which are of significant economic importance to the state and its communities including livestock grazing. Wyoming's rangelands are managed with consideration of the State's historical, cultural, and social development and in a manner which contributes to a diverse, balanced, competitive, and resilient economy to provide opportunity for economic development. BLM management of grazing on public lands contributes to the social and economic well-being of Wyoming communities throughout the region. BLM rangeland management and grazing allotments are also crucial to livestock grazing management programs and private ranching operations in the region and they also play an important role for in water development and overall land use.

The region's river basins, creeks, springs and associated bottomlands provide large suitable areas for irrigated hay crops. The region includes vast amounts of grasslands that are found on a variety of landforms, generally in low precipitation zones. The common grassland communities crossed by the 2-mile-wide corridors are composed of Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland, Northern Rocky Mountain Subalpine-Upper Montane Grassland, Southern Rocky Mountain Subalpine Grassland, Northwestern Great Plains Mixed Grass Prairie, Western Great Plains Sand Prairie, and Recently Burned Grassland GAP land cover categories. The majority of local ranches are authorized to graze livestock during a portion of the year on BLM administered allotments.

3.2.6.3 Grazing Allotments and Management

Table 3-61 indicates the number of allotments crossed by the 2-mile-wide corridor, total allotment acres, total acres affected by the Project, and affected alternative routes.

Table 3-61
Grazing Allotments in the Alternative Route Study Corridors

Management Agency	Number of Allotments Crossed	Total Allotment Acres	Total Acres Affected by Project	Relevant Alternative Routes
BLM Casper Field Office	31	432,927	77,284	3A: Proposed Action 3C: Lost Creek to Highway 20/26
BLM Lander Field Office	32	1,008,761	141,093	All in Segments 2 and 3
BLM Pinedale Field Office	16	235,095	56,774	All in Segments 1 and 2
BLM Rawlins Field Office	2	306,143	14,948	All in Segment 2
BLM Rock Springs Field Office	21	3,783,146	246,201	All in Segments 1 and 2

Grazing allotments cover large areas of BLM, state, and private lands in the study area. A grazing allotment is an area of land designated and managed for grazing of livestock. Congress, through the Taylor Grazing Act and FLPMA, has directed the BLM to authorize and administer livestock grazing on public lands in the 16 western states. Proper management and administration of livestock grazing is essential to protect the health of the public lands and provide stability to the western livestock industry dependent on the public rangelands.

It is the objective of the BLM to authorize and manage livestock grazing on public lands and other lands administered by the BLM under the principles of multiple use and sustained yield. Specific objectives of livestock grazing management and administration include:

1. authorize livestock grazing on public lands, as provided by RMPs;
2. improve rangeland resources by preparing and implementing equitable and environmentally sound decisions regarding land use, range management, and grazing authorization;

3. manage livestock grazing consistent with RMP and activity plan objectives and to achieve land health standards;
4. encourage consultation, cooperation, and coordination with rangeland users, intermingled landowners, and other interests as a part of the land use and livestock grazing management decision-making process;
5. determine appropriate stocking levels and grazing prescriptions based on soils and ecological site descriptions, inventory, land health assessments and evaluations, monitoring data, and RMP goals and objectives;
6. monitor rangeland resources and evaluate the effectiveness of management actions;
7. direct rangeland resources, including funds and personnel, to areas where the greatest need for management exists and the greatest return on investments can be realized;
8. promote and install cost-effective range improvements to improve the production of rangeland resources for a variety of uses, including livestock grazing, wildlife, and wild horses and burros, while maintaining or improving upland and riparian land health conditions; and
9. encourage private investment in range improvements.

Grazing permits or leases are issued to qualified applicants to authorize use on the public lands and other lands under the administration of the BLM that are designated as available for livestock grazing through land-use plans. Permits or leases specify the types and levels of use authorized, including livestock grazing and suspended use. These grazing permits and leases also specify terms and conditions pursuant to 43 CFR 4130.3, 4130.3–1, and 4130.3–2, such as the kind (e.g., cattle, sheep, horses, burros, and goats) and number of livestock and the allotment(s) to be used. Other grazing authorizations may also be issued, which are exchange-of-use agreements, nonrenewable grazing permits/leases, crossing permits, and special grazing permits/leases.

The term of grazing permits or leases authorizing livestock grazing on the public lands and other lands under the administration of the BLM is 10 years unless: (1) the land is being considered for disposal; (2) the land will be devoted to a public purpose that precludes grazing prior to the end of 10 years; (3) the term of the base property lease is less than 10 years, in which case the term of the federal permit or lease shall coincide with the term of the base property lease; or (4) the BLM Authorized Officer determines that a permit or lease for less than 10 years is in the best interest of sound land management.

Permitted use is granted to holders of grazing preference and is specified in all grazing permits/leases. Permitted use encompasses all authorized use (i.e., active, suspended use, and temporarily suspended use), except for permits/leases for ephemeral and designated annual rangelands. Permitted use is the forage allocated by or under the guidance of an applicable land-use plan for livestock grazing in an allotment under a permit/lease and is expressed in animal unit months (AUM). An AUM means the amount of forage necessary for the sustenance of one cow or its equivalent for a period of 1 month per 43 CFR 4100.0-5; therefore, one cow (or its equivalent) grazing 6 months on rangeland would consume 6 AUMs of forage.

For the purposes of calculating the AUM fee, an AUM is defined as a month's use and occupancy of range:

- by 1 cow, bull, steer, heifer, horse, burro, or mule; 5 sheep; or 5 goats, over the age of 6 months at the time of entering the public lands or other lands administered by the BLM;
- by any such weaned animals regardless of age; or
- by such animals that will become 12 months of age during the authorized period of use (43 CFR 4130.8-1(c)).

Actual use reports describe the actual grazing use that occurs during a given grazing season. The billed and actual use can vary depending on factors such as drought, wildfire, and market conditions.

Missouri River Basin Studies from 1962 are the main historical source for the original livestock carrying capacity and stocking rate calculations for grazing allotments in the study area, which was used to help determine permitted use. The BLM periodically reviews the permitted use specified in a grazing permit or lease and makes changes in the permitted use as needed to manage, maintain, or improve rangeland productivity; to assist in restoring ecosystems to properly functioning condition; to conform with land-use plans or activity plans; or to comply with the provisions of subpart 4180 of this part [43 CFR 4100.0-5]. These changes must be supported by monitoring, field observations, ecological site inventory, or other data acceptable to the BLM Authorized Officer, including land health assessments, with the subsequent evaluations of land health standards achievement.

Following consultation, cooperation, and coordination with the affected lessees or permittees, the state that having lands in the area or is responsible for managing resources in the area, and the interested public, the BLM may modify terms and conditions of the permit or lease when the active use or related management practices are not meeting the land-use plan, the allotment management plan or other activity plan, or management objectives or are not in conformance with the provisions of 43 CFR Subpart 4180. To the extent practical, the BLM provides to affected permittees or lessees, states that have lands in the affected area or are responsible for managing resources in the affected area, and the interested public an opportunity to review, comment, and give input during the preparation of reports that evaluate monitoring and other data that are used as a basis for making decisions to increase or decrease grazing use or to change the terms and conditions of a permit or lease.

3.2.6.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

This section examines grazing allotments crossed by the 2-mile-wide study corridors between the Riley Ridge Treatment Plant location and the Proposed Riley Ridge Sweetening Plant location. Table 3-62 lists the grazing allotments crossed by the 2-mile-wide study corridors in this segment.

Table 3-62
Grazing Allotments in Segment 1

Allotment Name	Acres[1]
Beaver Creek Individual	935
Bird Individual	599
South Piney Ranch Individual	978
Dry Piney Individual	1,902
South Piney PL Meadows	642
Figure Four	119,184
Beaver Cr. Meadow Individual	1,977
Reardon Canyon Com	22,092
North La Barge Com	135,160
Beaver Tract Individual	27
South Piney Individual	1,700
La Barge Unit Individual	2,106
Jory Individual	930
South Desert Allotment	34,585

NOTE: [1]Rounded to the nearest whole number. Some allotments may overlap into Segments 2 and 3.

3.2.6.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

This section examines grazing allotments crossed by the 2-mile-wide study corridors from the Riley Ridge Sweetening Plant to the Bairoil Interconnect. Table 3-63 lists the grazing allotments crossed by the 2-mile-wide study corridors in this segment.

Table 3-63 Grazing Allotments in Segment 2	
Allotment Name	**Acres[1]**
Poston	49,840
Big Sandy	59,801
Highway Gasson	99,202
Mountain	36,256
Eaton Place	518
Spicer Group	90
OSA	1,120
South Desert Allotment[2]	34,585
Red Desert	256,290
Sand Draw Allotment	31,699
Figure Four[2]	119,184
Rock Springs	598,479
Eighteen Mile	246,181
Houghton	368
Pacific Creek	197,577
Sands	110,292
Cyclone Rim	306,964
Bush Rim	98,774
Reservoir	37,155
Fourth of July	21,802
Arapahoe Creek	258,338
Crooks Gap	3,407
Little Sandy	113,068
Steamboat Mountain	36,937
Sublette	73,539
Lombard	94,732

NOTES:
[1]Rounded to the nearest whole number.
[2]Some allotments may overlap into Segments 1 and 3.

3.2.6.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

This section examines grazing allotments crossed by the 2-mile-wide study corridors from the Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect. Table 3-64 lists the grazing allotments crossed by the 2-mile-wide study corridors in this segment.

Table 3-64 Grazing Allotments in Segment 3	
Allotment Name	**Acres[1]**
Arapahoe Creek[2]	258,338
Cantril Jack Allotment	11,350
Cantril-Todd	16,881
Crooks Gap[2]	3,407
Diamond Springs	45,777
East Allotment	6,217
Eccles	13,781
Ervay Basin	211,178
F.L. Ranch	88,444
Fenced Allotment	12,927

Table 3-64
Grazing Allotments in Segment 3

Allotment Name	Acres[1]
Fenton	9,481
Forgey Place	4,460
Fraser Draw	100,537
Gas Hills	58,759
Granite Mountain Open	82,531
Hiland	5,093
JJ Winter Pastures	5,837
M & D	21,483
Madden Ranch Pasture	6,051
Matador	3,3947
Miller	10,144
Miller 2	6,522
Mitchell Pasture	1,821
Moneta Hills Pasture	8,963
Mountain	36,256
Mud Lake	2,549
Muskrat Open	111,096
Muskrat-Linn	86,385
North of CB&Q R.R.	1,884
North of Tracks	18,616
OSA	1,069
OSA	15,761
OSA	38
OSA	49
OSA	974
OSA	73
OSA	3,110
OSA	15,761
Osborne Place	14,441
Pine Mountain	13,855
Pipeline Pasture	6,892
Powder River Draw	6,362
Rigby Pasture	2,055
Sand Draw	1,461
South Deer Creek	18,067
South Deer Creek	2,415
South Hiland	21,207
South of CB&Q RR	7,266
South of Tracks	12,985
Springsteen	13,844
St. Clair South Pasture	4,773
Stampede Bog	3,460
State-71 Meadows	1,177
Stone Cabin	18,735
Strohecker	16,053
Summer Brewer	8,739
Tram Road Pasture	1,716
Waltman	6,358
Ward Place	14,536

Table 3-64 Grazing Allotments in Segment 3	
Allotment Name	**Acres[1]**
Wheatfield	206
Wyatt Draw	814
Wyatt Place	16,528
NOTES: [1]Rounded to the nearest whole number. [2]Allotments overlap into Segments 1 and 2.	

3.2.7 National Trails System

The NTSA of 1968 established a national network of scenic, historic, and recreation trails to provide for outdoor recreation needs; promote the enjoyment, appreciation, and preservation of open-air, outdoor areas, and historic resources; and encourage public access and citizen involvement. Of particular interest for the Project are NSTs and NHTs. NSTs and NHTs are authorized and designated only by an Act of Congress. NSTs are continuous trails more than 100 miles long that provide non-motorized routes with outstanding recreational opportunities. NHTs commemorate historic routes of exploration, migration, trade, communication, and military action. Additionally, NHTs must meet three criteria: (1) follow as closely as possible the actual route of historic use; (2) be of national significance; and (3) have significant potential for public recreation and/or interpretation opportunities (16 U.S.C. 1242). NSTs and NHTs are formally administered by various federal agencies; however, land ownership may be in public or private hands. Other historic trails crossed by the Project, and discussion on the requirements for analysis associated with NEPA and Section 106 of the NHPA, can be found in Section 3.2.2.

3.2.7.1 Regulatory Framework

Federal agencies must consider the effects of Proposed Actions on NSTs and NHTs under NEPA and the NTSA of 1968 (16 U.S.C. 1246). The law states that other uses along an NST or NHT, which will not substantially interfere with the nature and purposes of the trail, may be permitted by the Secretary charged with the administration of the trail. Reasonable efforts should be made to provide sufficient access opportunities to such trails and, to the extent practicable, efforts shall be made to avoid activities incompatible with the purposes for which such trails were established (16 U.S.C. 1246). More specifically, the Secretary of the Interior or the Secretary of Agriculture may grant easements and rights-of-way on, over, under, across, or along any component of the national trails system in accordance with the laws applicable to the national park system and the national forest system, respectively, provided that any conditions contained in such easements and rights-of-way shall be related to the policy and purposes of the NTSA (16 U.S.C. 1248).

A designation as either an NST or NHT requires a two-step process: (1) Congressional authorization of a feasibility study and (2) Congressional designation. While a trail is undergoing a national trail feasibility study or when a trail has been recommended as suitable for designation and Congress has not yet acted to designate the trail, the appropriate federal agency manages the values, characteristics, and settings of the trail in accordance with FLPMA. Following a Congressional designation, the development of a comprehensive management plan for the trail is required; the comprehensive management plan is then used by various agencies in the development of land-use planning documents (e.g., BLM field office RMPs and USFS Land and Resource Management Plan), which may introduce additional management prescriptions to protect trail resources.

In 2006 the National Trails System Memorandum of Understanding (06-SU-11132424-196) was signed by the BLM, NPS, USFWS, USFS, USACE, and Federal Highway Administration (FHWA) to encourage long-term interagency coordination under the authority of the NTSA. As part of this memorandum, these federal agencies would coordinate trail-wide administration and site-specific management, protect

resources, promote cultural values, foster cooperative relationships, share technical expertise, and fund lands and resources associated with the national trails. Subsequent to this memorandum, the BLM has implemented requirements as part of the BLM's National Trails System manual series: BLM manuals 6250, 6280, and 8353. The manuals provide administrative and management guidance.

- BLM Manual 6250 – National Scenic and Historic Trails Administration (Public) addresses specific functions delegated to the BLM from the Secretary of the Interior pursuant to the NTSA. Specifically, this manual describes how to conduct national scenic or historic trail feasibility studies, how to administer a national scenic or Historic Trail upon designation by Congress, and the responsibilities of national scenic or Historic Trail Administrators. This manual also identifies data and records management requirements.
- BLM Manual 6280 – Management of National Scenic and Historic Trails and Trails Under Study or Recommended as Suitable for Congressional Designation (Public) provides policies for the management of national scenic and historic trails. Specifically, this manual identifies requirements for the management of trails undergoing national trail feasibility study; trails that are recommended as suitable for National Trail designation through the national trail feasibility study; inventory, planning, management, and monitoring of designated national scenic and historic trails; and data and records management requirements for national scenic and historic trails.
- BLM Manual 8353 – Trail Management Areas – Secretarially Designated National Recreation, Water, and Connecting and Side Trails (Public) addresses secretarially designated national recreation trails (including the National Water Trails) and connecting and side trails, including requirements for cooperative relationships; trail marking; identifying, evaluating, and recommending trails; nominating trails through the submission of application packages; and data and records management.

For the purposes of NEPA and the Project-level analysis (implementation-level) addressed in this EIS, BLM Manual 6280 serves as the primary regulatory guidance (BLM 2012a). This manual details the steps required to identify and manage NST and NHT resources in the broader regulatory framework governing BLM-administered lands. More specifically, the manual provides policy direction regarding the BLM's management approach and the NEPA analysis requirements for designated trails (i.e., NSTs and NHTs) and trails undergoing congressionally authorized feasibility studies (trails under study).

As part of the NEPA analysis for any implementation-level activities proposed along NSTs and NHTs the BLM shall:

> (i) For each alternative, describe and analyze the potential impacts on the nature and purposes of the National Trail, and the National Trail resources, qualities, values, and associated settings and the primary use or uses of the trail.
>
> (ii) Describe the impacts on the national significance of National Trails, based on the NHPA National Historic Landmark criteria and other NTSA criteria, as well as impacts on the significance of properties that are eligible or listed in the NRHP, as applicable.
>
> (iii) Ensure adequate public involvement in the BLM's management activities through the NEPA, land use planning, and/or other applicable processes.
>
> (iv) Coordinate with the National Trail administering agency during the environmental review and land use planning processes, regarding the establishment of the National Trail Management Corridor.

(v) To the greatest extent possible, consider opportunities for mitigation to a level commensurate with the adverse impact on the nature and purposes; resources, qualities, values, and associated settings; and the primary use or uses of the National Trail.

(vi) Include the following in the Decision Record or ROD:

(a) Whether the Proposed Action will substantially interfere or will be incompatible with the nature and purposes of the National Trail, including the resources, qualities, values or associated settings or the primary use or uses.

(b) A description of the action taken to authorize or deny an activity or the application of any BMPs or mitigation measures (BLM 2012b).

The NEPA analysis for the Proposed Action will consider existing data, including data from the completed national trail feasibility study (if available), data provided to the BLM by the agency conducting the national trail feasibility study, or additional data collected as needed for alternative formulation and analysis. In evaluating whether to approve the Proposed Action, the NEPA analysis will:

(i) Describe the values, characteristics, and settings of trails under study and trails recommended as suitable in the affected environment section of the NEPA document.

(ii) Analyze and describe any impacts of the Proposed Action on the values, characteristics, and settings of trails under study or trails recommended as suitable.

(iii) Consider an alternative that would avoid adverse impacts on the values, characteristics, and settings of the trail under study or recommended as suitable and/or incorporate and consider applying design features to avoid adverse impacts.

(iv) When the Proposed Action is anticipated to have a significant adverse impact, there must be coordination between the BLM State Office and the assigned National Trail Feasibility Study agency office. If the anticipated significant adverse impact cannot be avoided, the BLM State Office must contact the BLM Washington Office so that coordination with the study agency headquarters office can be initiated (BLM 2012b).

The management of national trails occurs at two levels: (1) national trail administering agency, which is the federal agency assigned to develop the trail's comprehensive management, including the nature and purpose as well as providing the framework for the management of trail resources (e.g., NPS or USFS); and (2) the federal agency that administers the land crossed by the trail, which includes the BLM, NPS, USFS, and other federal land-management agencies.

There is one NST located in the Project study area, the CDNST, which is administered by the USFS. A comprehensive management plan was developed by the USFS in 1985 and amended in 2009. In addition to the direction provided in the comprehensive management plan, the BLM Lander Field Office has provided further management direction in their 2014 RMP.

Four designated NHTs and a route, which is a designated segment of the California NHT, under feasibility study are in the Project study area. The Sublette Cutoff Historic Trail is currently under feasibility study by the NPS to be appended to the Oregon NHT. The Oregon NHT and Mormon Pioneer NHT were designated as NHTs in 1978 to be administered by the NPS. The California NHT and Pony Express NHT were designated as NHTs in 1992 to also be administered by the NPS. All four of the NHTs are managed under the 1999 Comprehensive Management and Use Plan (update)/Final EIS. More detail

regarding direction from this management plan is included under Regional Setting and in the Affected Environment under the subheading Trail Management (Section 3.2.7.5.2.1).

It is important to note that management direction includes discussion of both "contributing" and "non-contributing" sites and segments. Individual sites/segments of the NHTs are evaluated based on the NRHP criteria of integrity (location, design, setting, materials, workmanship, feeling, and association). Segments of NHTs may no longer retain aspects of integrity necessary for NRHP eligibility and, therefore, may not contribute to the eligibility of the resource as a whole. Conversely, if NRHP criteria are met, the segment is considered contributing to the overall eligibility of the historic property." (Ollie et al. 2016). In addition to the management direction mentioned above, the following management direction on national trails located below was identified from applicable BLM RMPs as they relate to the analysis of the Project:

- 2008 Rawlins Resource Management Plan – no National Trails are in proximity to the Project.
- 2007 Casper Resource Management Plan – no National Trails are in proximity to the Project.
- 2008 Pinedale Resource Management Plan
    - Cultural Resource Management Goals associated with National Trails
        - Protect and preserve significant cultural resources for appropriate use by present and future generations.
        - Promote stewardship, conservation, and appreciation of cultural resources.
        - Provide opportunities for scientific, educational, recreational, and traditional uses of cultural resources.
        - Reduce imminent threats to eligible and unevaluated cultural resources from natural or human-caused impacts or potential conflict with other resource uses.
        - Develop a public outreach and education program to instill a preservation ethic in the public regarding archaeological and historic resources.
    - Cultural Resource Management Objective associated with National Trails:
        - Objective 1. Protect NRHP-eligible cultural sites and NHTs.
    - Cultural Resource Actions associated with National Trails

      j.) The Lander Trail (Note: similar alignment as the North Piney Creek to Smith's Fork High Potential Route Segment of the California NHT) and its visual historic setting will be protected through the establishment of a VRM Class II designation for about 71,510 acres of public land within 3 miles of contributing segments of the trail (Map 2-30).

      r.) Acquisition of conservation easements, when agreed upon by all consulting parties, including willing private landowners, could serve as a potential mitigation option for adverse effects on NHTs and their settings that could take place at other locations.

      s.) Segments of NHTs not selected for special management consideration will continue to be managed as directed in applicable RMPs and other activity plans and as required by the NHPA and the State Protocol between the Wyoming BLM and the Wyoming SHPO.
- 1997 Green River Resource Management Plan (Rock Springs RMP)
    - Congressionally Designated Historic Trails
        - The area within 0.25 mile or the visual horizon (whichever is less) of any contributing trail segment will be an avoidance area for surface disturbing activities (Map 3 and

Table 2). Developments such as roads, pipelines, and power lines may be allowed to cross trails in areas where previous disturbance has occurred and the trail segment has lost the characteristics that contribute to its National Register significance.

- No blading will be allowed on any historic trail unless necessary to protect life or property. Historic trails are not available for use as industrial access roads (e.g., oil and gas drilling access roads, or as haul roads for heavy truck traffic).

- 2014 Lander Resource Management Plan
  - National Trails Management Corridor Goals and Objectives
    - Goal SD 1: Provide users with opportunities to view, experience, and appreciate examples of prehistoric and historic human use of the resources along the Congressionally Designated Trails demonstrating how these resources are being managed: (1) in harmony with the environment, (2) in support of the nature and purposes for which the trail was designated, and (3) without detracting from the overall experience of the trail.
    - Goal SD 2: Maintain the CDNST corridor to provide high-quality scenic, primitive hiking and horseback riding opportunities. Conserve natural, historic, and cultural resources along the trail.
    - Goal SD 3: Use of the CDNST will minimally affect adjacent natural and cultural environments and harmonize with the management objectives of land and resource uses which are, or may be, occurring on the lands through which the trail passes.
    - Goal SD 4: Preserve and protect the historical remains and historical settings of the Oregon, Mormon Pioneer, California, and Pony Express NHTs and their associated historic sites for public use and enjoyment.
      - Objective SD 4.1: Maintain and enhance the significant qualities of high-potential NHT segments and sites as defined in the NTSA. Avoid adverse effects (as defined in the NHPA and the State Protocol between the Wyoming BLM and the Wyoming SHPO) to intact NHT segments, their settings, and associated sites.
      - Objective SD 4.2: SD: 4.2 Protect remnants, ruts, traces, graves, campsites, landmarks, artifacts, and other remains associated with the NHTs to enhance historical research and public use and enjoyment.
    - Goal SD 5: Provide for the outdoor recreation needs of an expanding population and promote the preservation of public access and enjoyment of the open air, outdoor areas, and historic resources of the nation, in a manner that supports the nature and purpose of the Congressionally Designated Trails.
      - Objective SD 5.1: Manage the landscape (viewshed) associated with the NHTs so that visitors continue to get a sense of how this landscape influenced emigrants along the trails.
      - Objective SD 5.2: Manage SRMAs along Congressionally Designated Trails for specific visitors, affected community residents, local governments and private sector businesses, or other constituents and the communities or places where these customers originate (recreation-tourism market).
      - Objective SD 5.3: Congressionally Designated Trails SRMA Objective: Specific outcome-focused objectives, recreation setting character conditions, and the administrative, marketing, and monitoring framework can be found below in the SRMA-specific objective and decisions.

- Objective SD 5.4: Congressionally Designated Trails Visitor Services Resource Protection Objective: Increase awareness, understanding, and a sense of stewardship in NHTs recreational activity participants so their conduct safeguards cultural and natural resources in accordance with the Wyoming Standards for Healthy Rangelands and other resource objectives.

- National Trails Management Corridor Management Actions
  - 7004 SD: 2-4; SD: 5.1: Manage the National Trails Management Corridor as VRM Class II. The Lost Creek, Lost Creek Spur, and Pathfinder designated utility crossings and the CDNST ERMA are managed as VRM Class III.
  - 7005 SD: 1; SD: 2-4; SD:4.1-4.2; SD: 5; SD: 5.1-5.6: Realty actions in the National Trails Management Corridor are managed as follows:
    - The National Trails Management Corridor is avoided for Rights-of-way except in designated utility corridors.
    - No realty actions will be authorized if it is determined by the Authorized Officer that impacts (both direct and cumulative) associated with the action will conflict with the nature and purpose of the Congressionally Designated Trails.
      - Realty actions associated with access and improvements on private land will be authorized if it is determined by the Authorized Officer that the following can be achieved:
        - They create no more than a weak contrast as viewed from the Congressionally Designated Trails
        - They meet VRM designations for the disturbance area, as viewed from Key Observation Points (KOP) impacted by the disturbance
      - Other realty actions will be authorized if it is determined by the Authorized Officer that the following can be achieved:
        - They are hidden from view of the Congressionally Designated Trails
        - They meet the VRM designation for the disturbance area, as viewed from KOPs impacted by the disturbance
  - 7006 SD: 1; SD: 2-4; SD:4.1-4.2; SD: 5; SD: 5.1-5.6: Authorize NHT crossings by new major utility systems only in the following designated utility corridors:
    - Beaver Creek Corridor (Map 34). This corridor is for below ground Rights-of-way only.
    - Pathfinder Corridor (Map 34). This corridor is for below ground Rights-of-way only.
    - Bison Basin Corridor (Map 34). This corridor is for below ground lines only, and must follow the criteria listed in Appendix C (page 191 of the BLM Lander RMP).
    - Lost Creek Corridor (Map 34). This corridor is for above and below ground Rights-of-way.
  - 7007 SD: 2; SD: 3: Motorized vehicle crossings or use on the CDNST is managed in accordance with the 2009 CDNST Comprehensive Plan. The BLM will not authorize activities that will expose CDNST trail users to heavy/frequent motorized traffic along the trail unless the proposed activity is in a location that currently experiences heavy/frequent motorized traffic (county and BLM-maintained roads).

3.2.7.2 Regional Setting

In addition to the direction provided in the BLM RMPs above, associated with direct management of the lands crossed by the National Trails, language from the NPS and USFS management plans (who programmatically administered the trails), and a brief trail history are provided in the following section for context. It is important to note that while all four of the NHTs described below are programmatically administered by the NPS, the trails are managed by agencies and landowners whose property they cross.

3.2.7.2.1 Oregon National Historic Trail

The Oregon NHT was established by Congress in 1978 as an NHT under the NTSA and is administered by the NPS. An amended comprehensive plan was developed in 1999 and includes the trail's nature and purpose. While the comprehensive management plan does not specifically state the trail nature and purpose, the comprehensive management plan does identify the trail's purpose and significance.

The purposes of the trail are:

- to identify, preserve, and interpret the sites, route, and history of the Oregon Trail for all people to experience and understand; and
- to commemorate the westward movement of emigrants to the Oregon country as an important chapter of our national heritage.

The trail is significant because:

- it was the first trail that demonstrated the feasibility of moving families, possessions, and cultures by wheeled vehicles across an area previously perceived as impassable;
- it was the corridor for one of the largest and longest emigration of families in the history of the U.S.
- it is a symbol of American westward traditional migration embodied in traditional concepts of pioneer spirit, patriotism, and rugged individualism; and
- it strengthened the U.S.' claim to the Pacific Northwest

The comprehensive management plan, does not specifically identify primary uses, but instead lists types of recreation uses for all four trails contained in the plan including: historic interpretation, heritage tourism, commemorative activities, and media interest with specific opportunities to follow the trail by walking, biking, horseback riding, using a handcart, using a covered wagon, visiting trail sites and related features, driving along auto tour routes, reading interpretive brochures and publics, and visiting associated museums and education facilities along the route.

As described in the comprehensive management plan, a national trail right-of-way has not yet been established for the Oregon NHT. Trail management corridors established by the BLM field offices crossed by the trail are described by Project segment in the affected environment.

Federal protection components identified in the comprehensive management plan, including high potential segments, high potential sites, and the auto tour route, are described by Project segment in the affected environment.

The Oregon NHT is an approximately 1,800-mile-long network of trails, river crossings, and landmarks that were originally established by Native American tribes, and later refined by the early European-American explorers and fur trappers. The trail started in Independence, Missouri, and traveled west passing several towns, and made it to Fort Hall, Idaho. It stretched farther West and eventually reached Willamette Valley, Oregon. At many places, trails were blazed to maintain the corridor and alternate routes were established to shorten the trail, to get around rugged topography, or avoid hostile territory.

The Oregon NHT was regularly used by fur trappers, traders, explorers, missionaries, emigrants, and military expeditions, from the early 1820s through the late 1860s (BLM 2010b, 2012d; Larson 1978).

The first wave of immigrants came during the 1830s as protestant missionaries journeyed west to convert the native populations and establish missions (Hutchinson and Jones 1993). In the early 1840s, several organized wagon trains on the Oregon NHT set out from Missouri for a greater life out west. Hundreds of thousands more would follow, especially after the discovery of gold in California in 1848 (Hutchinson and Jones 1993). Traffic on the trail increased sharply with the massive Mormon migrations beginning in the late 1840s (BLM 2010b; Kimball 1994:380–381).

The Mormon migration led by Brigham Young began in 1847, starting at Winter Quarters, Nebraska, and generally followed the Oregon NHT to Fort Bridger, Wyoming; Mormon parties then followed the 1846 Hastings Cutoff southwest from Fort Bridger to reach the Salt Lake Valley. Mormons continued to use this route until the completion of the transcontinental railroad in 1869 (NPS 2015b). Also, during the late 1840s, several military posts were established along the Oregon NHT to protect emigrants from the continued threat of the Native Americans (NPS 1999). Portions of the Oregon NHT continued to be used into the late 1890s; however, use of the route declined once the transcontinental railroad was completed in 1869.

3.2.7.2.2 Mormon Pioneer National Historic Trail

The Mormon Pioneer NHT was established by Congress in 1978 as an NHT under the NTSA and is administered by the NPS. An amended comprehensive plan was developed in 1999 and includes the trail's nature and purpose. While the comprehensive management plan does not specifically state the trail nature and purpose, the comprehensive management plan does identify the trail's purpose and significance.

The purposes of the trail are:

- to identify, preserve, and explain the sites, route, and history of the Mormon Pioneer Trail for all people to experience and understand; and
- to commemorate the nineteenth century migration of Mormon emigrants to the Valley of the Great Salt Lake as an important aspect of our national heritage.

The trail is significant because:

- the trail was used by cohesive Mormon companies seeking religious freedom, with the intent of locating their new Zion in the Far West
- the trail was traveled/developed by communities or companies of people with the intent of bringing church members to settle the Valley of the Great Salt Lake and surrounding regions
- the trail was part of the westward movement that provided an improved route into the Great Basin
- the Mormons, in using the trail in both directions, improved the route and provided assistance along the way

The types of recreation uses for the Mormon Pioneer NHT are the same as the Oregon NHT.

As described in the comprehensive management plan, a national trail right-of-way has not yet been established for the Mormon Pioneer NHT. Trail management corridors established by the BLM field offices crossed by the trail are described by Project segment in the affected environment.

Federal protection components identified in the comprehensive management plan, including high potential segments, high potential sites, and the auto tour route, are described by Project segment in the affected environment.

The Mormon Pioneer NHT covers 1,300 miles across five states, including Illinois, Iowa, Nebraska, Utah, and Wyoming. The trail was used in 1846 and 1847 by thousands of Mormons (later known as members of the Church of Jesus Christ of Latter-day Saints) on their quest for religious freedom. The church was founded by Joseph Smith on April 6, 1830 (NPS 2015b). Prior to his death, Joseph Smith had begun planning for a westward expansion; Brigham Young stepped in as the leader of the Church of Jesus Christ of Latter-day Saints after Smith's death, and the Mormon migration to Salt Lake City, Utah began in 1846 (NPS 2015b).

The expedition from Nauvoo, Illinois, to Salt Lake City, Utah, was split into two segments, which were tackled in 1846 and 1847. Brigham Young and 3,000 Mormons set out to cover the first segment (265 miles from Nauvoo to the Missouri River at Council Bluffs, Iowa), on February 4, 1846 (NPS 2015b). Some emigrants settled there, and others crossed the Missouri River and settled in Winter Quarters in what is now considered Omaha. Brigham Young's original plan had been to reach the Rocky Mountains by the fall of 1846.

On April 5, 1847, Brigham Young and 148 people began the 1,032-mile trek out of Winter Quarters toward the Great Salt Lake Valley in Utah. For the initial portion of the trek, the Mormons followed the Oregon NHT, also known as the Great Platte River Road (NPS 2015b). This took them along the Platte River across Nebraska, along the North Platte River to Fort Laramie/Fort John, and finally across Wyoming to Fort Bridger. From Fort Bridger, the Mormon emigrants followed a route that the Reed-Donner party had created across Utah on their way to California the year before. On July 24, 1847, 116 miles from Fort Bridger, the Mormons arrived in the Great Salt Lake Valley. Nearly 70,000 Mormons made the trek along the Mormon Trail from 1847 to 1869, when the transcontinental railroad was completed (NPS 2015b).

3.2.7.2.3 California National Historic Trail

The California NHT was established by Congress in 1992 as an NHT under the NTSA and is administered by the NPS. A comprehensive plan was developed in 1999 and includes the trail's nature and purpose. While the comprehensive management plan does not specifically state the trail nature and purpose, the comprehensive management plan does identify the trail's purpose and significance.

The purposes of the trail are to:

- enable all people to envision and experience, in a coherent and convenient way, the heritage and impacts of the western overland migration.
- encourage preservation of its history and physical remains.

The trail is significant because:

- it is one of the major highways of the nineteenth century, which provided a 2,400-mile path for emigrants to the West. Their resulting settlement significantly contributed to change in peoples, cultures, and landscapes.
- one of the largest overland migrations in American westward expansion used the trail as a result of the California gold rush.
- the route, followed earlier by Native Americans and western explorers and travelers, provided a foundation for American transportation and communication systems west of the Mississippi River.

The types of recreation use for the California NHT are the same as the Oregon NHT.

As described in the comprehensive management plan, a national trail right-of-way has not yet been established for the California NHT. Trail management corridors established by the BLM field offices crossed by the trail are described by Project segment in the affected environment.

Federal protection components identified in the comprehensive management plan, including high potential segments, high potential sites, and the auto tour route, are described by Project segment in the affected environment.

The California NHT covers a total of 5,839 miles in 10 states, including: Missouri (18 miles); Kansas (290 miles); Nebraska (1,067 miles); Colorado (16 miles); Wyoming (1,088 miles); Idaho (457 miles); Oregon (424 miles); Utah (349 miles); Nevada (1,136 miles); and California (994 miles) (NPS 1999:36). Today, approximately 1,100 miles of the trail are still visible on the ground as trail ruts, traces, and other remnants, and more than 2,100 miles cross public lands (NPS 2015a). Between 1841 and 1860, more than 200,000 emigrants utilized the California NHT in the hopes of joining the gold rush, improve their economic circumstances, and/or obtain better farmlands (NPS 1999:33). Emigrants along the trail came from multiple ethnic backgrounds, economic levels, and educational and religious circumstances.

3.2.7.2.3.1 Sublette Cutoff of the California National Historic Trail

The Sublette Cutoff is part of the California NHT and is also currently under feasibility study by the NPS as part of the Four Trails Feasibility Study Revisions/Environmental Assessment (EA) Project: Revisions to Feasibility Studies for Oregon, Mormon Pioneer, California, and Pony Express NHTs to be added to the Oregon NHT.

Emigrant trails that crossed the country were not always aligned strictly east to west; people eager to move west faster than trail conditions allowed were known to look for shorter routes and create "cutoffs." This was the case in particular for those emigrants heading for the gold rush in California. One of the most popular cutoffs was the Sublette Cutoff. The cutoff was opened in 1844 by the Murphy-Townsend Company (Wyoming SHPO n.d.). The cutoff crossed the desert for 45 miles from Big Sandy to the Green River Crossing. This allowed emigrants who were not headed to Salt Lake City, Utah, to avoid turning south toward Fort Bridger and instead continue in a more northwesterly direction to Oregon.

3.2.7.2.4 Pony Express National Historic Trail

The Pony Express NHT was established by Congress in 1992 as an NHT under the NTSA and is administered by the NPS. A comprehensive plan was developed in 1999 and includes the trail's nature and purpose. While the comprehensive management plan does not specifically state the trail nature and purpose, the comprehensive management plan does identify the trail's purpose and significance.

The purposes of the trail are to:

- identify, preserve, and explain the sites, route, and history of the Pony Express for all people to experience and understand.
- commemorate the rapid mail delivery that linked eastern and western states.

The trail is significant because:

- the Pony Express proved the viability of a central U.S. overland communication system and was a forerunner of a transcontinental telegraph and railroad.
- the Pony Express required organizational skills to join the populous East and the West.
- the horse-and-rider relay system used by the Pony Express became the nation's most direct and fastest means of east-west communications before completion of the telegraph system.

- the Pony Express played a vital role in aligning California with the Union by providing a link between the eastern states and California just before the Civil War; it allowed westerners to develop and maintain a sense of contact with the East at a critical time in U.S. history.
- the Pony Express made important contributions to journalism, commerce, and personal domestic and international communication by providing news and original documents in a timely manner
- the lone riders and isolated stations became a lasting image of the West.

The types of recreation use for the Pony Express NHT are the same as the Oregon NHT.

As described in the comprehensive management plan, a national trail right-of-way has not yet been established for the Pony Express NHT. Trail management corridors established by the BLM field offices crossed by the trail are described by Project segment in the affected environment.

Federal protection components identified in the comprehensive management plan, including high potential segments, high potential sites, and the auto tour route, are described by Project segment in the affected environment.

In 1850 the federal government began contract mail service to the growing western settlements via the Oregon NHT. In 1858 the contract for the eastern division of the central mail service route from Independence, Wisconsin, to Salt Lake City, Utah, went to John M. Hockaday. A year later, Hockaday sold out to the freighting company of Russell, Majors, and Waddell, who established the Pony Express (BLM 2010b). A crew of young expert riders carried it out. Each rode more than 100 miles a day, changing horses every 10 to 15 miles (BLM 2010b). Initiated on April 3, 1860, mail was carried in both directions between St. Joseph, Missouri, and Sacramento, California, via the Oregon Trail in Wyoming. Mail would be carried between these cities every 10 to 15 days (Benson 1995:3-5). The historic route followed portions of the Oregon and California NHT corridors through eastern Wyoming and South Pass to Fort Bridger. From there it made use of the Mormon Pioneer Trail into the Salt Lake valley, Utah (BLM 2010b).

The advance of a telegraph line had an effect on the Pony Express service throughout its operation (Benson 1995:1). The completion of the transcontinental telegraph in October 1861 signaled the end of the Pony Express (Benson 1995:3-5). Telegraphs could be sent much faster and with less expense. This forced the abandonment of the Pony Express (Benson 1995:15). Mail contracts were given to a competing stage company and the Central Overland California and Pike's Peak Company, the parent company of the Pony Express, was sold at auction (Benson 1995:15).

3.2.7.2.5 Continental Divide National Scenic Trail

The CDNST was established by Congress in 1978 as an NST under the NTSA and is administered by the USFS. A comprehensive plan was developed in 1985 (amended in 2009) and includes the trail's nature and purpose, which has been refined from the original 1976 *Continental Divide Trail Study Report* through decades of management (USFS 2009). As stated in the amended 2009 comprehensive management plan, the trail's nature and purpose is "to provide for high-quality scenic, primitive hiking and horseback riding opportunities and to conserve natural, historic, and cultural resources along the Continental Divide National Scenic Trail corridor" (USFS 2009). The CDNST stretches from the U.S. border with Canada to the Mexican border and roughly follows the Continental Divide of the Americas. As stated in the 1976 Continental Divide National Scenic Trail Study Report, this scenic trail was envisioned to provide a continuous trail route designed for the hiker and horseman to access lands where the environment remains relatively unaltered. In 1997 the Deputy Chief of the USFS clarified this vision to maintain the scenic trail for non-motorized recreation.

The primary use of the CDNST is to provide primitive recreational opportunities of national significance as the 3,100-mile trail crosses the western U.S. from Canada to Mexico. There are a multitude of recreation use opportunities along the CDNST, including but not limited to hiking, cycling, camping, snowshoeing, and wildlife viewing.

The 2009 comprehensive management plan identifies a 50-mile-wide zone of concern that lies on either side of the geographic Continental Divide, which allows for subsequent relocation of the trail right-of-way in this zone of concern without further Acts of Congress. Trail management corridors established by the BLM field offices crossed by the trail are described by Project segment in the affected environment.

Due to the detailed nature of the trail data inventory, the discussion of National Trail Systems is organized by project segment and further broken down by each alternative route in each segment.

3.2.7.3 Inventory Methodology

To characterize National Scenic and Historic Trails, inventory data received from the BLM and NPS was used to characterize the affected environment for all national scenic and historic trails, as well as trails under study or trails recommended as suitable, for all alternative routes regardless of jurisdiction.

Based on the guidance provided in BLM Manual 6250 and 6280, the following items were considered in the analysis of national scenic and historic trails:

- Identified trail components (e.g., high potential route segments)
- Viewshed analyses
- Scenic resources
- Historic and cultural resources
- Recreation resources
- Natural resources
- Other landscape elements as applicable

By considering these components associated with National Trails, a comprehensive inventory of resources associated with these trails was identified. These resources range from management direction and prescriptions to opportunities for the public to interpret the trail's historic and scenic setting.

The BLM field offices and NPS provided both trail administrative and resource data to identify resources associated with each National Trail. Where available, the BLM NHT Inventory Project data was used and supplemented with BLM field office data. These data were identified as part of the affected environment where located within 3 miles of the Project's alternative routes, which is consistent with other resources documented in this Draft EIS. Unique landscape features associated with the trail or trail interpretive recreation areas beyond this area were identified, where appropriate, by the BLM national trails staff (e.g., Parting of the Ways Site). The following descriptions provide detail regarding the source of data used to assess the National Trails in proximity to the Project. It is important to note that the four NHTs share a broad corridor east of the Parting of the Ways site; but due to different periods of significance and management direction, are discussed individually.

3.2.7.3.1 Trail Components

To provide the framework for each national trail, from both a management and trail-resource perspective, the affected environment identifies and describes the following:

- Nature and purpose of the national trail, if available
- Trail's resources, qualities, values, and associated setting(s)
- Primary use(s)

- National trail right-of-way and management corridor
- For NHT, federal protection components
- National trail-related NRHP (eligible and listed) properties.

The Federal Protection Components were limited to the high potential route segments, high potential historic sites, and auto tour routes as directed by BLM Manual 6280 (BLM 2012a).

- Nature and Purposes of the National Trail. The trail's nature and purposes are defined by the character, characteristics, and congressional intent for a designated national trail, including the resources, qualities, values, and associated settings of the areas through which such trails may pass; the primary use or uses of a national trail; and activities promoting the preservation of, public access to, travel in, and enjoyment and appreciation of such trails. Only those national trails that have been through the comprehensive management planning process have a formal nature and purpose statement. It is important to note that trails undergoing a feasibility study also do not have a nature and purpose statement but based on BLM Manual 6280, this is not a data gap as these trails should only be analyzed according to the trail's resources, qualities, values, and associated settings.
- National Trail Resources, Qualities, Values, and Associated Settings. The resources, qualities, and values are defined as the significant scenic, historic, cultural, recreation, natural (including biological, geological, and scientific), and other landscape areas through which such trails may pass, as identified in the NTSA. Associated settings are defined as the geographic extent of the resources, qualities, and values or landscape elements in the surrounding environment that influence the trail experience and contribute to resource protection. In the context of an implementation action NEPA assessment, only those resources, qualities, values, and associated settings potentially affected by the Project would be inventoried. Based on consultation with the BLM, a Trail Study Corridor for the Project was defined as a 6-mile-wide corridor centered on the trail and clipped to lands within 3 miles of the Project alternative route reference centerlines except where identified by the BLM to extend this study area based on proximity of key trail resources (e.g., Parting of the Ways).
- Primary Use or Uses. The primary use or uses are defined as the authorized mode or modes of travel, and/or activities identified in the NTSA, enabling legislation, or legislative history, through the trailwide Comprehensive Management Plan or approved RMP.
- National Trail Right-of-Way and Management Corridor. The national trail right-of-way is described as the corridor selected by the national trail administering agency in the trailwide Comprehensive Management Plan, which includes the area of land that is of sufficient width to encompass national trail resources, qualities, values, and associated settings. The national trail management corridor is described as the allocation established through the land-use planning process for a public land area of sufficient width in which to encompass national trail resources, qualities, values, and associated settings and the primary use or uses that are present or that are to be restored.
- NHTs, Federal Protection Components (including high potential historic sites and high potential historic route segments) and Auto Tour Routes. Federal protection components are those selected high potential historic sites and high potential route segments and other land- and water-based components of a designated NHT located on federally owned land that meet the NHT criteria listed in the NTSA and that are identified in trailwide Comprehensive Management Plans, RMPs, and implementation plans. Auto tour routes are defined as those roads that parallel the NHT and provide opportunities to commemorate and/or interpret the historic route as an alternate experience. These opportunities may occur inside or outside the national trail management corridor. Auto tour route opportunities may include access to NHT high potential historic sites

and high potential historic route segments, although it is not required. Auto tour routes are normally restricted to existing all-weather roads or paved highways and may be limited to specific use conditions per BLM Manual 6280.

- National Trail-related NRHP. Includes properties formally determined as eligible for inclusion in the NRHP; properties listed in the NRHP by the Secretary of the Interior and all other significant properties that meet NRHP listing criteria. This includes any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP maintained by the Secretary of the Interior.

3.2.7.3.2 Viewshed Analysis

A viewshed analysis was conducted for each NST and NHT (including trails under study) to refine the Project trail study corridor associated with each trail based on potential visibility and effects of the Project. This viewshed analysis was used to identify landscape features that would be seen or not seen from the national trail as well as to determine the areas where the most intense impacts would occur based on the construction, operation, and maintenance of the Project. As described in Section 3.2.18.5, the area of most intense impacts on visual resources would occur within 3 miles of the Project and as such, the viewshed was conducted out to 3 miles from the trail features described below, which differ between an NST and NHT. For NSTs, the viewshed was conducted from the latest congressionally designated continuous trail alignment. For NHTs, a viewshed analysis was conducted from the high potential route segments, high potential historic sites, and auto tour routes identified in the trail comprehensive management plan. For trails under feasibility study, the viewshed was conducted from the trail alignment under study by the NPS.

3.2.7.3.3 Scenic Resources

As part of the affording the public an opportunity to vicariously share the experience of the original users of these trails, the following visual resource components were used to form the affected environment including the identification of publicly accessible recreation and interpretive sites (KOPs), greater than average scenic values, and other BLM Visual Resource Inventory (VRI) and management components. The intent of including these additional BLM visual resource components is to provide a comprehensive description of the setting using the best available data.

The inventory of scenic resources associated with national trails includes (1) BLM VRI (scenic quality rating units [SQRU], sensitivity level rating units [SLRU], visual distance zones [VDZ], VRI Classes) and (2) Project KOPs, and (3) BLM VRM Classes. BLM Manual 6280 requires the use of BLM VRI to characterize the affected environment for all national trails. The addition of the Project-associated KOPs provides additional detail to analyze potential effects on the national trails that may not be captured by the broader-scale BLM planning-level inventory data. Please refer to Section 3.2.18.5 for descriptions of these visual resource components.

3.2.7.3.4 Historic and Cultural Resources

The process for the complete inventory and assessment of historic and cultural resources is described in Section 3.2.2, which includes a discussion on the requirements for analysis associated with NEPA and Section 106 of the NHPA. For the purposes of analyzing potential effects on NHT-related cultural resources resulting from the construction, operation, and maintenance of the Project, the inventory of historic and cultural resources focused on inventory of trail traces associated with the portion of the BLM NHT Inventory Project completed by Metcalf Archaeological Consultants, Inc. (Rockwell et al. 2012), in addition to NHT-related sites and segments identified in available cultural resource datasets. Additional efforts to identify NHT-related historic and cultural resources included review of the following data sets for sites or segments in the National Trails study area:

- NPS list of designated NHTs to identify the presence of historic trails of national significance.
- Review of NHT-related SHPO data (Ollie et al. 2016).
- Shape file of the North Sublette Meadow Springs variant of the Sublette Cutoff of the California NHT provided by the BLM Rock Springs Field Office.
- NHT Inventory (Rockwell et al. 2012) data (not available in the WYCRO database), including contributing segments identified.

Combined, these NHT data consist of shape files for recorded trail segments, approximate trail routes based on historic maps, and point data containing other known associated resources (e.g., stations, crossings, inscriptions, and human burial sites).

Aside from including data related to the Oregon NHT, Mormon Pioneer NHT, California NHT, and Pony Express NHT (which overlap throughout the study area and are collectively referred to as the Emigrant NHTs), these datasets include primary variants of the NHTs – including the Lander Cutoff of the California NHT and the Sublette Cutoff of the California NHT.

The historic trails data analysis also targeted significant historic sites that may be associated with NHTs or early emigrant trails that are not listed in the NPS data. In an effort to identify these sites, historic component sites were selected in proximity (500 feet) of the above-mentioned trails for each 6-mile corridor of each alternative route. This distance was established to focus on historic sites directly adjacent to the trails, to increase the likelihood that they were related to the trails (refer to Ollie et al. 2016).

Table 3-65 summarizes contributing sites and segments of the Emigrant NHTs and their primary variants by alternative route. For this analysis, those contributing trail segments within 100 feet of the alternative route centerlines are considered directly crossed. Other contributing trail segments are simply listed as occurring within 3-mile buffers at locations where Project alternative routes cross NHTs.

Table 3-65
Contributing Sites and Segments of the Emigrant National Historic Trail and Primary Variants by Alternative Route

Alternative Route	Trails	Trail Segments Directly Crossed	Trail Segments (6-mile-wide corridor)	Sites
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant				
1A: Proposed Action	Lander Cutoff of the California NHT	None	48SU387_4, 48SU387_5, 48SU387 _8, 48SU387_10, 48SU387_34, 48SU387_48, 48SU387_49, 48SU387_51	None
1A Variation: Dry Basin Draw	Lander Cutoff of the California NHT	None	Same segments as those identified for Alternative 1A: Proposed Route	
1B: Dry Piney	Lander Cutoff of the California NHT	None	Same segments as those identified for Alternative 1A: Proposed Route	
1C: Figure Four	Lander Cutoff of the California NHT	None	Same segments as those identified for Alternative 1A: Proposed Route	

Table 3-65
Contributing Sites and Segments of the Emigrant National Historic Trail and Primary Variants by Alternative Route

Alternative Route	Trails	Trail Segments Directly Crossed	Trail Segments (6-mile-wide corridor)	Sites
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect				
2A: Proposed Action	Emigrant NHTs	48SW827_131	48SW827_132	Little Sandy Crossing of the Sublette Cutoff of the California NHT
	Sublette Cutoff of the California NHT	48SW1841 (Segment 1)	48SW1841 (Segment 2)	
	North Sublette Meadow Springs variant	None	48SU7344_3, 48SU7344_6	
2B: Southern Route	Emigrant NHTs	48SW827_145 (NHTs Inventory)	48SW827_144, 48SW827_151, 48SW827_142 and _143	Simpson's Hollow, Mormon Knolls
	Sublette Cutoff of the California NHT	48SW1841_88	48SW1841_87	
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect				
3A: Proposed Action	Emigrant NHTs	48FR736_199	48FR736_198, 48FR736_208	Inscriptions (2), Fourth Crossing, Three Crossings Station, Three Crossings (third crossing), Three Crossings (second crossing), First Crossing of Sweetwater, Benett Tribbett gravesite
			48NA207_141, 48NA207_143	
3B: Lost Creek to Lost Cabin	Emigrant NHTs	48FR736_199	48FR736_198, 48FR736_208	
			48FR717_36, 48FR717_40, 48FR717_44, 48FR717_110, 48FR717_112, 48FR717_118, 48FR717_120	
3C: Lost Creek to Highway 20/26	Emigrant NHTs	48FR736_199	48FR736_198, 48FR736_208	
			48NA207_33, 48NA207_34, 48NA207_102, 48NA207_108	

NOTE: The Project trail study corridor was defined as a 6-mile-wide corridor centered on the trails and clipped to lands within 3 miles of the Project alternative route reference centerlines except where identified by the BLM.

By separating the effects associated with Section 106 of the NHPA and BLM Manual 6280, associated with the NTSA, this section identifies opportunities for the public to vicariously experience these trails than the specific requirements required by Section 106 which have a different threshold for effects. The definitions for the condition of trail traces are described in Table 3-66.

Table 3-66
National Historic Trail Condition Categories

Category	Definition
NHT I	Location verified, evident, and unaltered
NHT II	Location verified and evident with minor alteration
NHT III	Location verified with little remaining evidence
NHT IV	Location verified and permanently altered
NHT V	Location approximate or not verified
NHT VI	Location verified with historic reconstruction

3.2.7.3.5 Recreation Resources

Building on the KOPs described in scenic resources, recreation sites in proximity to National Trails were identified using land-use data including recreation sites and trails as well as special designations (e.g., ACECs and SRMAs) in the Project trail study corridor. By including these recreation sites and areas, opportunities to vicariously experience the National Trails allows for a more complete analysis of Project effects in addition to effects on scenic and historic settings.

3.2.7.3.6 Natural Resources

The inventory of natural resources associated with each National Trail focuses on vegetation communities, including characteristic vegetation communities and riparian areas, which shaped the experience of those using the National Trail during its period of significance. By focusing the inventory of natural resources on those most associated with the use of the trail, the resulting impacts provide an understanding of what may be affected by the Project that may not necessarily be captured in discussions associated with scenic and historic settings. In addition to these elements, landscape-defining characteristics, including prominent or distinctive aspects, qualities, and characteristics, were identified as part of the inventory of scenic resources, specifically the BLM SQRU.

3.2.7.3.7 Other Landscape Elements

Existing conditions (i.e., cultural modifications such as developments, facilities, etc.) were reviewed for each NST and NHT that may be paralleled or located adjacent to the Project to provide a relative level of landscape modification in proximity to the trails. In the NST and NHT study areas, existing conditions range from natural appearing to highly modified based on the presence of existing transmission lines (both high and low voltage), substations, pipelines (water and high pressure natural gas), travel routes (i.e., road rights-of-way), residential and commercial development, and other man-made features that are incongruent with the natural or historic character of these landscapes.

3.2.7.3.8 Setting Description

The setting is defined as the geographic extent of the resources, qualities, and values or landscape elements in the surrounding environment that influence the trail experience and contribute to resource protection in context with the Project alternative route reference centerlines. For NSTs, the setting description identifies significant scenic or high visual qualities in the trail study areas. For NHTs, the setting description identifies areas associated with greater than average scenic quality that support the nature and purpose and/or relative freedom from intrusion in and adjacent to high potential sites and segments. Note regarding historic setting specifically, the quality of the setting does not dictate level of effects and is only associated with the scenic resources portion of the inventory.

3.2.7.4 Oregon National Historic Trail

3.2.7.4.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

The Oregon NHT is not adjacent to Segment 1 of the study area.

3.2.7.4.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

3.2.7.4.2.1 Trail Management

Nature and Purpose. Refer to Regional Setting (Section 3.2.7.2.1).

Primary Uses. Refer to Regional Setting (Section 3.2.7.2.1).

National Trail Right-of-Way and Management Corridor. No National Trail right-of-way has been established. The BLM Rock Springs RMP identified an avoidance area within 0.25 mile of any contributing trail segment, in which disturbances are allowed only if not visible from the trail segment.

3.2.7.4.2.2 Trail Components

High Potential Historic Sites. The Parting of the Ways site is in the Project trail study corridor.

High Potential Historic Route Segments. The following segments are in the Project trail study corridor:

- Big Sandy to Green River
- South Pass

Auto Tour Routes. The Oregon NHT auto tour route utilizes the alignment of Lower Farson Road and Wyoming State Highway 28 in proximity to this Project segment.

3.2.7.4.2.3 Scenic and Recreation Resources

BLM VRI Components. The following components of the Rock Springs Field Office VRI would be in the Project trail study corridor:

- SQRU: Class B (Big Sandy Recreation Area and Jack Morrow Hills SQRUs) and Class C (Sublette Flats, Little Colorado Desert, and Dry Sandy Hills SQRUs) landscapes
- SLRU: Areas of high and moderate sensitivity
- VDZs: Foreground-middleground
- VRI Classes: Class II, III, and IV

Project Key Observation Points. The following KOP locations are associated with this portion of the Oregon NHT:

- KOP RS-4 NHT Auto Tour Route adjacent to Big Sandy to Green River High Potential Route Segment was selected due to its association with the NHT Auto Tour and proximity to high potential route segments and views of BLM VRM Class IV lands.
- KOP RS-6 South Pass High Potential Route Segment was selected due to its association with the Oregon NHT and proximity to high potential route segments and views of BLM VRM Class IV lands.

BLM VRM Classes. This Project segment would be in proximity to VRM Class III and IV lands in the Rock Springs Field Office adjacent to the Oregon NHT.

Adjacent Recreation Sites and Areas. The Red Desert Backway Byway and Pilot Butte Overlook recreation sites are in the Project trail study corridor.

Adjacent Special Designations. No trail resource associated special designations are in the Project trail study corridor.

3.2.7.4.2.4 Historic and Cultural Resources

The inventory of trail traces conducted by the BLM, as part of the NHT Inventory Project (Rockwell et al. 2012), identified NHT Class I, II, and IV traces in proximity to this Project segment. The following trail-associated cultural site is in the Project trail study corridor:

- Simpson Hollow

3.2.7.4.2.5 Biological, Natural, and Other Resources

Vegetation along this portion of the Oregon NHT is dominated by sagebrush and areas of desert scrub with riparian vegetation adjacent to Simpson Gulch, Big Sandy River, Sandy Creek, Pacific Creek, and other smaller drainages. No other biological or natural resource issues were identified for the Oregon NHT in this area. Existing modifications in proximity to this portion of the Oregon NHT are limited to an existing pipeline adjacent to Wyoming State Highway 28.

3.2.7.4.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

3.2.7.4.3.1 Trail Management

Nature and Purpose. Refer to Regional Setting (Section 3.2.7.2.1).

Primary Uses. Refer to Regional Setting (Section 3.2.7.2.1).

National Trail Right-of-Way and Management Corridor. No National Trail right-of-way has been established. The BLM Lander RMP established 481,976 acres as a National Trails Management Corridor (refer to Map 43 in the BLM Lander RMP) associated with all National Trails traversing the southern portion of the field office. To cross this management corridor, the BLM Lander RMP states new linear utility projects are to cross within designated utility corridors including the Lost Creek Corridor.

3.2.7.4.3.2 Trail Components

High Potential Historic Sites. The Three Crossings/Deep Sand Route site is in the Project trail study corridor.

High Potential Historic Route Segments. The South Pass segment is in the Project trail study corridor.

Auto Tour Routes. The Oregon NHT auto tour route utilizes the alignment of U.S. Highway 287 in proximity to this Project segment.

3.2.7.4.3.3 Scenic and Recreation Resources

BLM VRI Components. The following components of the Lander Field Office VRI would be located within the Project trail study corridor:

- SQRU: Class B (Sweetwater Valley, Granite Mountains, Agate Flats SQRUs) and Class C (Sweetwater Plains SQRU) landscapes
- SLRU: Areas of high sensitivity
- VDZs: Foreground-middleground
- VRI Classes: Class II and III

Project Key Observation Points. The KOP L-2 South Pass (East) High Potential Route was selected due to its association with the Oregon NHT and proximity to a high potential route segment and views of BLM VRM Class II lands.

BLM VRM Classes. This Project segment would be in proximity to VRM Class II and III lands in the Lander Field Office adjacent to the Oregon NHT.

Adjacent Recreation Sites and Areas. No designated recreation sites or areas are in the Project trail study corridor.

Adjacent Special Designations. Trail resources associated with special designations located in the Project trail study corridor include:

- NHTs Destination SRMA
- Green Mountain ERMA (managed for exceptional recreation values)
- NHTs ERMA

3.2.7.4.3.4 Historic and Cultural Resources

The inventory of trail traces conducted by the BLM, as part of the NHT Inventory Project (Rockwell et al. 2012), identified no traces in proximity to this Project segment. The following trail-associated cultural sites are in the Project trail study corridor:

- Bennett Tribbett gravesite
- Three crossings of the Sweetwater River (first crossing)
- Three crossings of the Sweetwater River (second crossing)
- Three crossings of the Sweetwater River (third crossing)
- Fourth crossing of the Sweetwater River
- Two inscriptions sites

3.2.7.4.3.5 Biological, Natural, and Other Resources

Vegetation along this portion of the Oregon NHT is dominated by the Sweetwater River and its associated riparian corridor which contrast with the adjacent dry sagebrush and desert scrub areas typical of the Wyoming Basin. A unique landscape north of the Sweetwater River is the Granite Mountains, most western portion of this range, which rise above the sagebrush plains and include areas of barren rock and limber pine-juniper woodlands. No other biological or natural resource issues were identified for the Oregon NHT in this area. Existing modifications in proximity to this portion of the Oregon NHT include a 230kV transmission line, a series of pipelines, and a few oil and gas wells.

3.2.7.5 Mormon Pioneer National Historic Trail

3.2.7.5.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

The Mormon Pioneer NHT is not located in or adjacent to the Segment 1 study area.

3.2.7.5.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

3.2.7.5.2.1 Trail Management

Nature and Purpose. Refer to Regional Setting (Section 3.2.7.2.2).

Primary Uses. Refer to Regional Setting (Section 3.2.7.2.2).

National Trail Right-of-Way and Management Corridor. No National Trail right-of-way has been established. The BLM Rock Springs RMP identified an avoidance area within 0.25 mile of any contributing trail segment, in which disturbances are allowed only if not visible from the trail segment.

3.2.7.5.2.2 Trail Components

High Potential Historic Sites. The sites are the same as the Oregon NHT.

High Potential Historic Route Segments. The segments are the same as the Oregon NHT.

Auto Tour Routes. Same as the Oregon NHT.

3.2.7.5.2.3 Scenic and Recreation Resources

BLM VRI Components. The components of the Rock Springs Field Office VRI located in the Project trail study corridor are the same as the Oregon NHT.

Project Key Observation Points. The following KOP locations are associated with this portion of the Mormon Pioneer NHT and are the same as the Oregon NHT.

BLM VRM Classes. This Project segment would be in proximity to VRM Class III and IV lands in the Rock Springs Field Office adjacent to the Mormon Pioneer NHT.

Adjacent Recreation Sites and Areas. Same as the Oregon NHT.

Adjacent Special Designations. Same as the Oregon NHT.

3.2.7.5.2.4 Historic and Cultural Resources

The inventory of trail traces conducted by the BLM, as part of the NHT Inventory Project (Rockwell et al. 2012), identified NHT Class I, II, and IV traces in proximity to this Project segment. The following trail-associated cultural sites are in the Project trail study corridor:

- Mormon Knolls
- Simpson Hollow

3.2.7.5.2.5 Biological, Natural, and Other Resources

The biological, natural, and other resources are the same as the Oregon NHT.

3.2.7.5.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

3.2.7.5.3.1 Trail Management

Nature and Purpose. Refer to Regional Setting (Section 3.2.7.2.2).

Primary Uses. Refer to Regional Setting (Section 3.2.7.2.2).

National Trail Right-of-Way and Management Corridor. No National Trail right-of-way has been established. The BLM Lander RMP established 481,976 acres as a National Trails Management Corridor (refer to Map 43 in the BLM Lander RMP) associated with all National Trails traversing the southern portion of the field office. To cross this management corridor, the BLM Lander RMP states new linear utility projects are to cross within designated utility corridors including the Lost Creek Corridor.

3.2.7.5.3.2 Trail Components

High Potential Historic Sites. The sites are the same as the Oregon NHT.

High Potential Historic Route Segments. No historic route segments are in this segment.

Auto Tour Routes. Same as the Oregon NHT.

3.2.7.5.3.3 Scenic and Recreation Resources

BLM VRI Components. The components of the Lander Field Office VRI located in the Project trail study corridor are the same as the Oregon NHT.

Project Key Observation Points. No KOPs were specifically identified for this Project segment as the linear KOP associated with the other NHTs in this area is not a high potential route segment for the Mormon Pioneer NHT.

BLM VRM Classes. This Project segment would be in proximity to VRM Class II and III lands in the Lander Field Office adjacent to the Mormon Pioneer NHT.

Adjacent Recreation Sites and Areas. Same as the Oregon NHT.

Adjacent Special Designations. The trail resources associated with special designations located in the Project trail study corridor are the same as the Oregon NHT.

3.2.7.5.3.4 Historic and Cultural Resources

The inventory of trail traces conducted by the BLM, as part of the NHT Inventory Project (Rockwell et al. 2012), identified no traces in proximity to this Project segment. No additional specific trail-associated cultural sites were identified in the Project trail study corridor.

3.2.7.5.3.5 Biological, Natural, and Other Resources

The biological, natural, and other resources are the same as the Oregon NHT.

3.2.7.6 California National Historic Trail and Sublette Cutoff

3.2.7.6.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

The Sublette Cutoff is not located in or adjacent to the Segment 1 study area.

3.2.7.6.1.1 Trail Management

Nature and Purpose. Refer to Regional Setting (Section 3.2.7.2.3).

Primary Uses. Refer to Regional Setting (Section 3.2.7.2.3).

National Trail Right-of-Way and Management Corridor. No National Trail right-of-way has been established. The BLM Pinedale RMP identified an area of VRM Class II within 3 miles of contributing segments of the Lander Trail to protect its visual historic setting (Note: this trail shares a similar alignment as the North Piney Creek to Smith's Fork High Potential Route Segment associated with the California NHT).

3.2.7.6.1.2 Trail Components

High Potential Historic Sites. No historic sites located in this segment.

High Potential Historic Route Segments. The North Piney Creek to Smith's Fork segment is in the Project trail study corridor.

Auto Tour Routes. The auto tour route for the California NHT is not located in proximity to this Project segment.

3.2.7.6.1.3 Scenic and Recreation Resources

BLM VRI Components. The following components of the Pinedale Field Office VRI would be in the Project trail study corridor:

- SQRU: Class A (Wyoming Foothills SQRU), Class B (Deer Hills and Piney Creek SQRUs) and Class C (N. La Barge SQRU) landscapes
- SLRU: Areas of high, moderate, and low sensitivity
- VDZs: not available
- VRI Classes: not available

Project Key Observation Points. The KOP P-1 North Piney Creek to Smith's Fork High Potential Route Segment was selected due to its association with the California NHT and proximity to high potential segments and views of BLM VRM Class II lands.

BLM VRM Classes. This Project segment would be in proximity to VRM Class II, III, and IV lands in the Pinedale Field Office adjacent to the California NHT.

Adjacent Recreation Sites and Areas. No designated recreation sites or areas are in the Project trail study corridor.

Adjacent Special Designations. No trail resource associated special designations are in the Project trail study corridor.

3.2.7.6.1.4 Historic and Cultural Resources

The inventory of trail traces conducted by the BLM, as part of the NHT Inventory Project (Rockwell et al. 2012), identified no traces in proximity to this Project segment. No additional specific trail-associated cultural sites were identified in the Project trail study corridor.

3.2.7.6.1.5 Biological, Natural, and Other Resources

Vegetation along this portion of the California NHT is characterized by the increasing elevation along Middle Piney Creek from arid, sagebrush communities to montane forests associated with the Wyoming Range foothills. Additionally, the narrow riparian corridor along Middle Piney Creek in the Wyoming Range foothills widens into a broad agriculturally influenced corridor at lower elevations. No other biological or natural resource issues were identified for the California NHT in this area. Existing modifications in proximity to this portion of the California NHT include oil and gas wells, several pipelines, and the Riley Ridge Treating Plant.

3.2.7.6.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

3.2.7.6.2.1 Trail Management

Nature and Purpose. Refer to Regional Setting (Section 3.2.7.2.3).

Primary Uses. Refer to Regional Setting (Section 3.2.7.2.3).

National Trail Right-of-Way and Management Corridor. No National Trail right-of-way has been established. The BLM Rock Springs RMP identified an avoidance area within 0.25 mile of any contributing trail segment in which disturbances are allowed only if not visible from the trail segment.

3.2.7.6.2.2 Trail Components

High Potential Historic Sites. The sites are the same as the sites for the Oregon NHT.

High Potential Historic Route Segments. The segments are the same as the segments for the Oregon NHT. The Sublette Cutoff portion of the California NHT splits north from the main route of the California NHT, at the Parting of the Ways high potential historic site, continuing westward toward the community of La Barge.

Auto Tour Routes. The auto tour routes are the same as the routes for the Oregon NHT.

3.2.7.6.2.3 Scenic and Recreation Resources

BLM VRI Components. The components of the Rock Springs Field Office VRI located in the Project trail study corridor are the same as the Oregon NHT.

Project Key Observation Points. The KOP locations are the same as the Oregon NHT with the addition of the KOP RS-5 Sublette Cutoff of the California NHT which was selected due to its association with the Sublette Cutoff of the California NHT (under study by the NPS to be added to the Oregon NHT) and views of BLM VRM Class IV lands.

BLM VRM Classes. This Project segment would be in proximity to VRM Class III and IV lands in the Rock Springs Field Office adjacent to the California NHT and Sublette Cutoff

Adjacent Recreation Sites and Areas. Same as the Oregon NHT. As is relevant to the Sublette Cutoff, Big Sandy Reservoir and associated recreation sites are in the Project trail study corridor.

Adjacent Special Designations. Same as the Oregon NHT.

3.2.7.6.2.4 Historic and Cultural Resources

The historic and cultural resources are the same as the Oregon NHT. As is relevant to the Sublette Cutoff, the inventory of trail traces conducted by the BLM, as part of the NHT Inventory Project (Rockwell et al. 2012), identified NHT only Class I and II traces in proximity to this Project segment. The Little Sandy Crossing trail-associated cultural sites are in the Project trail study corridor.

3.2.7.6.2.5 Biological, Natural, and Other Resources

The biological, natural, and other resources are the same as the Oregon NHT. As is relevant to the Sublette Cutoff, vegetation along this portion is dominated by sagebrush and areas of desert scrub with riparian vegetation adjacent to Buckhorn Canyon, West Buckhorn Draw, Sandy Creek, Dry Sandy Creek, and other smaller drainages. No other biological or natural resource issues were identified for the Sublette Cutoff of the California NHT in this area. Existing modifications in proximity to this portion of the

Sublette Cutoff of the California NHT include oil and gas wells and an existing pipeline adjacent to Wyoming State Highway 28.

3.2.7.6.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

The Sublette Cutoff of the California NHT is not located in or adjacent to the Segment 3 study area.

3.2.7.6.3.1 Trail Management

Nature and Purpose. Refer to Regional Setting (Section 3.2.7.2.3).

Primary Uses. Refer to Regional Setting (Section 3.2.7.2.3).

National Trail Right-of-Way and Management Corridor. No National Trail right-of-way has been established. The BLM Lander RMP established 481,976 acres as a National Trails Management Corridor (refer to Map 43 in the BLM Lander RMP) associated with all National Trails traversing the southern portion of the field office. To cross this management corridor, the BLM Lander RMP states new linear utility projects are to cross within designated utility corridors including the Lost Creek Corridor.

3.2.7.6.3.2 Trail Components

High Potential Historic Sites. The sites are the same as the Oregon NHT.

High Potential Historic Route Segments. The segments are the same as the Oregon NHT.

Auto Tour Routes. Same as the Oregon NHT

3.2.7.6.3.3 Scenic and Recreation Resources

BLM VRI Components. The components of the Lander Field Office VRI located in the Project trail study corridor are the same as the Oregon NHT.

Project Key Observation Points. The KOP locations are the same as the Oregon NHT.

BLM VRM Classes. This Project segment would be in proximity to VRM Class II and III lands in the Lander Field Office adjacent to the California NHT.

Adjacent Recreation Sites and Areas. Same as the Oregon NHT.

Adjacent Special Designations. Same as the Oregon NHT.

3.2.7.6.3.4 Historic and Cultural Resources

The inventory of trail traces conducted by the BLM, as part of the NHT Inventory Project (Rockwell et al. 2012), identified no traces in proximity to this Project segment. No additional specific trail-associated cultural sites were identified in the Project trail study corridor.

3.2.7.6.3.5 Biological, Natural, and Other Resources

The biological, natural, and other resources are the same as the Oregon NHT.

3.2.7.7 Pony Express National Historic Trail

3.2.7.7.1.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

The Pony Express NHT is not located in or adjacent to the Segment 1 study area.

3.2.7.7.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

3.2.7.7.2.1 Trail Management

Nature and Purpose. Refer to Regional Setting (Section 3.2.7.2.4).

Primary Uses. Refer to Regional Setting (Section 3.2.7.2.4).

National Trail Right-of-Way and Management Corridor. No National Trail right-of-way has been established. The BLM Rock Springs RMP identified an avoidance area within 0.25 mile of any contributing trail segment, in which disturbances are allowed only if not visible from the trail segment.

3.2.7.7.2.2 Trail Components

High Potential Historic Sites. The sites are the same as the Oregon NHT.

High Potential Historic Route Segments. The segments are the same as the Oregon NHT.

Auto Tour Routes. Same as the Oregon NHT.

3.2.7.7.2.3 Scenic and Recreation Resources

BLM VRI Components. The components of the Rock Springs Field Office VRI located in the Project trail study corridor are the same as the Oregon NHT.

Project Key Observation Points. The KOP locations are the same as the Oregon NHT.

BLM VRM Classes. This Project segment would be in proximity to VRM Class III and IV lands in the Rock Springs Field Office adjacent to the Pony Express NHT.

Adjacent Recreation Sites and Areas. Same as the Oregon NHT.

Adjacent Special Designations. Same as the Oregon NHT.

3.2.7.7.2.4 Historic and Cultural Resources

The historic and cultural resources are the same as the Oregon NHT.

3.2.7.7.2.5 Biological, Natural, and Other Resources

The biological, natural, and other resources are the same as the Oregon NHT.

3.2.7.7.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

3.2.7.7.3.1 Trail Management

Nature and Purpose. Refer to Regional Setting (Section 3.2.7.2.4).

Primary Uses. Refer to Regional Setting (Section 3.2.7.2.4).

National Trail Right-of-Way and Management Corridor. No National Trail right-of-way has been established. The BLM Lander RMP established a National Trails Management Corridor associated with all National Trails traversing the southern portion of the field office.

3.2.7.7.3.2 Trail Components

High Potential Historic Sites. The sites are the same as the Oregon NHT.

High Potential Historic Route Segments. The segments are the same as the Oregon NHT.

Auto Tour Routes. Same as the Oregon NHT.

3.2.7.7.3.3 Scenic and Recreation Resources

BLM VRI Components. The components of the Lander Field Office VRI located in the Project trail study corridor are the same as the Oregon NHT.

Project Key Observation Points. The KOP locations are the same as the Oregon NHT.

BLM VRM Classes. This Project segment would be in proximity to VRM Class II and III lands in the Lander Field Office adjacent to the Pony Express NHT.

Adjacent Recreation Sites and Areas. Same as the Oregon NHT.

Adjacent Special Designations. Same as the Oregon NHT.

3.2.7.7.3.4 Historic and Cultural Resources

The historic and cultural resources are the same as the Oregon NHT.

3.2.7.7.3.5 Biological, Natural, and Other Resources

The biological, natural, and other resources are the same as the Oregon NHT.

3.2.7.8 Continental Divide National Scenic Trail

3.2.7.8.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

The CDNST is not located in or adjacent to the Segment 1 study area.

3.2.7.8.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

3.2.7.8.2.1 Trail Management

Nature and Purpose. Refer to Regional Setting (Section 3.2.7.2.5).

Primary Uses. Refer to Regional Setting (Section 3.2.7.2.5).

National Trail Right-of-Way and Management Corridor. Refer to Regional Setting for the National Trail right-of-way. The BLM Lander RMP established a National Trails Management Corridor which includes the area within a 0.25-mile buffer from the CDNST.

3.2.7.8.2.2 Trail Components

The alignment for the CDNST from Crooks Mountain to Crooks Creek utilizes existing 4x4 roads and two-track along Spring Creek crossing Crooks Gap Road.

3.2.7.8.2.3 Scenic and Recreation Resources

BLM VRI Components. The following components of the Lander Field Office VRI would be in the Project trail study corridor:

- SQRU: Class B (Antelope Hills, Green Mountain, and Crooks Mountain SQRUs) and Class C (Crooks Gap SQRU) landscapes
- SLRU: Areas of high sensitivity
- VDZs: Foreground-middleground and seldom seen
- VRI Classes: Class II, III, and IV

Project Key Observation Points. The KOP L-3 CDNST was selected due to its association with the CDNST and views of BLM VRM Class III lands.

BLM VRM Classes. This Project segment would be in proximity to VRM Class III lands in the Lander Field Office adjacent to the CDNST.

Adjacent Recreation Sites and Areas. No additional designated recreation sites or areas are in the Project trail study corridor.

Adjacent Special Designations. Trail resources associated with special designations located in the Project trail study corridor include:

- CDNST SRMA
- Green Mountain ERMA (managed for exceptional recreation values)
- CDNST ERMA

3.2.7.8.2.4 Historic and Cultural Resources

No trail-related cultural or historic resources, including NRHP-listed sites, were identified in the Project's study area associated with the CDNST.

3.2.7.8.2.5 Biological, Natural, and Other Resources

Vegetation along this portion of the CDNST is dominated by sagebrush and areas of desert scrub with riparian vegetation adjacent to Crooks Creek and other smaller drainages. No other biological or natural resource issues were identified for the CDNST in this area. Existing modifications in proximity to this portion of the CDNST include a 230kV transmission line, a series of pipelines, and a few oil and gas wells.

3.2.7.8.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Nature and Purpose. Refer to Regional Setting (Section 3.2.7.2.5).

Primary Uses. Refer to Regional Setting (Section 3.2.7.2.5).

National Trail Right-of-Way and Management Corridor. Same as Segment 2.

3.2.7.8.3.1 Trail Components

Trail components for Segment 3 are discussed in Section 3.2.7.8.2.2

3.2.7.8.3.2 Scenic and Recreation Resources

BLM VRI Components. The following components of the Lander Field Office VRI would be in the Project trail study corridor:

- SQRU: Class B (Green Mountain and Crooks Mountain SQRUs) and Class C (Crooks Gap SQRU) landscapes
- SLRU: Areas of high sensitivity
- VDZs: Foreground-middleground and seldom seen
- VRI Classes: Class II, III, and IV

Project Key Observation Points. No KOPs were specifically identified for this Project segment, but effects from the KOP RS-6 will be included where the alignment of the CDNST is in the Project trail study corridor.

BLM VRM Classes. This Project segment would be in proximity to VRM Class II and III lands in the Lander Field Office adjacent to the CDNST.

Adjacent Recreation Sites and Areas. No additional designated recreation sites or areas are in the Project trail study corridor.

Adjacent Special Designations. Trail resources associated with special designations located in the Project trail study corridor include:

- Green Mountain ACEC (managed for scenic and wildlife values)
- CDNST SRMA
- Green Mountain ERMA (managed for exceptional recreation values)
- CDNST ERMA

3.2.7.8.3.3 Historic and Cultural Resources

No trail-related cultural or historic resources, including NRHP-listed sites, were identified in the Project's study area associated with the CDNST.

3.2.7.8.3.4 Biological, Natural, and Other Resources

Vegetation along this portion of the CDNST is dominated by sagebrush and areas of desert scrub with riparian vegetation adjacent to Crooks Creek and other smaller drainages. As the NST ascends Crooks Mountain, areas of montane forest are located adjacent to the trail alignment. No other biological or natural resource issues were identified for the CDNST in this area. Existing modifications in proximity to this portion of the CDNST include a 230kV transmission line, a series of pipelines, and a few oil and gas wells.

3.2.8 Native American Concerns

Initial contact with Native American tribes began on September 27, 2013, with a pre-application informational letter introducing the Project; soliciting feedback about concerns the tribes might have regarding the possible presence of TCPs or places of cultural, traditional, or spiritual importance in the Project area; and inviting the tribes to attend the pre-application meetings in Gillette, Wyoming, on October 30, 2013; in Lander, Wyoming, on October 31, 2013; and in Rock Springs, Wyoming, on November 1, 2013.

In compliance with Section 106 of the NHPA, the BLM initiated government-to-government consultation for the Project by sending letters to 14 Native American tribes on July 9, 2014. Letters were sent to the Cheyenne River Sioux Tribe, the Crow Tribe, the Crow Creek Sioux Tribe, the Eastern Shoshone Tribe of the Wind River Reservation, the Fort Peck Assiniboine and Sioux Tribes, the Northern Arapaho Tribe of the Wind River Reservation, the Northern Cheyenne Tribe, the Oglala Sioux Tribe, the Rosebud Sioux Tribe, the Shoshone-Bannock Tribes of the Fort Hall Reservation, the Sisseton-Wahpeton Oyate Tribes, the Standing Rock Sioux Tribe, the Ute Indian Tribe of the Uintah and Ouray Reservation, and the Yankton Sioux Tribe. The letters notified the tribes of scheduled scoping meetings in Rock Springs, Big Piney, Lander, and Casper, Wyoming. At the suggestion of the Eastern Shoshone Tribe of the Wind River Reservation, the Comanche Nation of Oklahoma was invited to be a consulting party in April 2015, bringing the total number of tribes invited to consult to 15 tribes.

Currently, 14 tribes are consulting parties for the Project, including the Cheyenne River Sioux Tribe, the Comanche Nation of Oklahoma, the Crow Tribe, the Crow Creek Sioux Tribe, the Eastern Shoshone Tribe of the Wind River Reservation, the Fort Peck Assiniboine and Sioux Tribes, the Northern Arapaho Tribe of the Wind River Reservation, the Northern Cheyenne Tribe, the Oglala Sioux Tribe, the Rosebud Sioux Tribe, the Shoshone-Bannock Tribes of the Fort Hall Reservation, the Standing Rock Sioux Tribe, the Ute Indian Tribe of the Uintah and Ouray Reservation, and the Yankton Sioux Tribe. The Sisseton-Wahpeton Oyate Tribes have formally declined consulting party status.

As part of the scoping process, Project updates were provided to the tribes and several coordination meetings were held with the BLM and tribal representatives to provide an update on the state of the Project, to ask for tribal representatives' views on the identification of sites/areas of concern, and to listen to any Native American concerns about the Project. This process has provided Native American tribes, as well as individual tribal members, potentially affected by the undertaking the opportunity to participate in the Project as a consulting party and identify potential effects of the implementation of the Project on areas of Native American concern. A field visit of the Project area was held from September 28 to October 1, 2015, to provide tribal representatives with an overview of the location of the alternative routes, resources, and Project area. Representatives of eight tribes (Cheyenne River Sioux Tribes, Crow Creek Sioux Tribe, Crow Tribe, Eastern Shoshone Tribe of the Wind River Reservation, Northern Arapahoe Tribe of the Wind River Reservation, Northern Cheyenne Tribe, Rosebud Sioux Tribe, and Shoshone-Bannock Tribes of the Fort Hall Reservation) attended the field visit. The cultural resources sites and areas visited had been identified as of potential concern for the tribes. For information regarding Native American consultation, refer to Section 5.2.2.3.

3.2.8.1 Regulatory Framework

Pursuant to 36 CFR Part 800.2, the lead federal agency must consult with Native American tribes that "attach religious and cultural significance to historic properties that may be affected by an undertaking" (Section 101[d][6][B] of the NHPA). This requirement applies regardless of the location or land status of the historic property. In such cases, the federal agency must notify Native American tribes potentially affected by the undertaking and give those Native American tribes the opportunity to participate in the Project as consulting parties, should they wish to do so.

Federal legislation and policy applicable to tribal consultation in the Project study area is listed below. Many of these regulations also apply to the protection of cultural resources and are described in Section 3.2.2.1.

- NHPA (54 U.S.C. 300101 et seq.; 36 CFR Part 800), specifically Section 106 (54 U.S.C. 306108), directs federal agencies to consider the effects of their actions on historic properties and provide the tribes a reasonable opportunity to comment.

- Archaeological Resources Protection Act of 1979, as amended (54 U.S.C. 302101) authorizes federal land-management agencies to manage, through a permit process, the excavation and/or removal of archaeological resources on federal lands. Prior to issuance of permits, the land-management agencies must consult with Native American tribes with interests in the resources. In addition, the law sets penalties for the damage or defacement and unpermitted excavation or removal of archaeological resources on federal lands.
- The American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996) requires federal lead agencies and/or federal land-management agencies to consult with affected Native American tribes regarding federal actions that would pose potential conflicts with freedom to practice traditional Native American religions.
- NAGPRA (25 U.S.C. 3001-3002) provides a process through which federal agencies consult with affected Native Americans regarding the treatment and return of human remains, funerary objects, sacred objects, and items of cultural patrimony identified on federal lands.
- Executive Order 13007, issued in 1996, directs federal land-management agencies to accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of sacred sites. Where appropriate, agencies will maintain the confidentiality of these sites.
- Executive Order 13175, issued in 2000, charges each federal agency with engaging in timely and meaningful consultation and collaboration with Indian tribal governments, strengthening the government-to-government relationship between the U.S. and Indian tribes, and reducing the imposition of unfunded mandates upon Indian tribes.
- Government-to-Government Relations with Native American Tribal Governments Memorandum (signed by President Clinton on April 29, 1994; 59 *Federal Register* 22951, May 4, 1994) directs that prior to taking actions that affect federally recognized tribal governments, federal agencies shall consult, to the greatest extent practicable and to the extent permitted by law, with the tribal governments. Federal agencies must assess the impact of federal government plans, projects, programs, and activities on tribal trust resources and ensure that tribal government rights and concerns are considered during such development.
- Religious Freedom Restoration Act of 1993 [42 U.S.C. 2000bb–2000bb-4] prohibits federal agencies from substantially burdening any person's exercise of religion, even if the burden results from a rule of general applicability, except if the federal agencies demonstrate that application of the burden to the person is in furtherance of a compelling governmental interest and is the least restrictive means of furthering that compelling interest.
- Secretarial Order 3206 was issued in 1997 by the Secretary of the Interior and the Secretary of Commerce, pursuant to the ESA (16 U.S.C. 1531, as amended), the federal-tribal (i.e., government-to-government) trust relationship, and other federal law. The order directs component agencies of the DOI and the Department of Commerce to carry out their responsibilities under the ESA in a manner that harmonizes the federal trust responsibility to tribes, tribal sovereignty, and statutory missions of the departments and that strives to ensure that Native American tribes do not bear a disproportionate burden for the conservation of listed species.
- DOI Policy on Consultation with Indian Tribes outlines the DOI's consultation framework for fulfilling its tribal consultation obligations, including requirements for government-to-government consultation between tribal officials and department officials.
- BLM Instruction Memorandum (IM) No. 2010-037, Tribal Consultation and Cultural Resource Authorities, provides an update on the BLM's tribal outreach initiative, emphasizes the importance of tribal relations and partnerships for the BLM and the DOI, and discusses revision

of the national Programmatic Agreement the BLM maintains with the ACHP and National Conference of SHPOs.

- BLM Manual MS-1780, Tribal Relations, and BLM Handbook H-1780-1, Improving and Sustaining Tribal Relationships support the BLM's commitment to work with tribes and provide a foundation for increased communication and collaboration between the BLM and tribes. The manual and handbook include guidance specific to BLM programs at all levels of the agency.
- The BLM will abide by all treaties with tribes.

At present, Wyoming has no state statutes or guidelines pertaining to tribal consultations. Wyoming handles inadvertently discovered Native American human remains the same as the discovery of any human remains in accordance with Wyoming State Statute 7-4-101 to 7-4-211. The Coroner's Office will need to determine if any human remains discovered constitute a Coroner's case under Wyoming State Statute 7-4-104.

3.2.8.1.1 Defining Traditional Cultural Properties

In 1992 the NHPA was amended to explicitly allow that properties of traditional, religious, and cultural importance to a Native American tribe or other cultural communities or ethnic groups may meet the criteria for listing in the NRHP. The National Register Bulletin No. 38 states that a "traditional cultural property is a property can be defined generally as one that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community (Parker and King 1998)." As with other cultural resources, TCPs are identified per the procedures set forth under 36 CFR 800. Their importance is assessed similarly in accordance with NRHP criteria (36 CFR 60.4).

TCPs embrace a wide range of historic properties, including places of traditional tribal origin; places imbued with a spiritual power or house spiritual beings; places where medicine is made or locations with therapeutic value; human burial and battle grounds; traditional hunting and plant gathering areas; and gathering places where ceremonial, artistic, economic, political, or other types of practices took place and continue to reinforce cultural identity. These sites of cultural and historical importance may or may not contain physical evidence and are usually identified through consultation with the communities that may or may not value them.

Although there are currently no formally designated TCPs in the Project study area, the Cedar Ridge TCP is located near Segment 3. During the BLM's government-to-government consultation, additional TCPs could be identified and evaluated through direct consultation with Native American tribes or other cultural communities or ethnic groups for which a property has importance.

3.2.8.2 Cultural Context

Cultural resources are described in Section 3.2.2.2 of this EIS.

3.2.8.3 Native American Concerns Summary

Issues raised during initial coordination/consultation with Native American tribes potentially affected by the Project include direct and indirect effects on cultural resources that are or may be relevant to the tribes, human remains, cultural landscapes, plant-gathering locations and hunting areas, and natural resources (e.g., greater sage-grouse and other wildlife and their habitats, ethnobotanical resources, water). Some tribes are particularly concerned with the proximity of the Project to the Cedar Ridge TCP, cultural resources related to the Cedar Ridge TCP, and the Chimney Butte and Boars Tusk landscapes. Some tribes also have expressed concern about the cumulative effects of pipeline projects on natural and

cultural resources of tribal importance across the state of Wyoming. The tribes also have expressed concern about the NEPA process and how cultural resources (including TCPs) will be addressed, the level of planning and participation involved in the Project and the role of the tribes, the tribal consultation process and the logistics of in-person consultation meetings and field visits, the Programmatic Agreement document, cultural resources contractor selection for the Project, cultural resources data gathering and information sharing between the BLM and the tribes, visual effects of the Project, public health and safety issues, and increased accessibility to areas of tribal importance by others. Additional concerns include confidentiality, the treatment of human burial sites and human remains, mitigation, tribal monitoring and assistance in the identification of any discovery, and concerns about the proliferation of pipelines in Wyoming.

Tribal input has indicated that the tribes are interested in providing their own reports that would identify sites of tribal importance and in participating in cultural resources site visits and TCP inventories. Concerns have also been raised that all alternative routes are not being inventoried. The possibility that other tribes may comment on the Project, in areas where those tribes have no ancestral ties, is of concern to the tribes. In addition, tribes have expressed concern about boring under the Green River (pipeline leakage or breakage and spills of CO_2 and H_2S gas into the river) and about the protection of other water sources in the Project area. Tribes have also expressed concerns about the safety of the pipeline in general, as well as the design and engineering elements that will be employed by the Applicant to ensure pipelines safety. Refer to Section 4.3.8.1, Table 4-67, for a list of the tribes that have been contacted and the concerns they have raised to date.

Ongoing coordination and consultation with Native American tribal governments may identify additional resources of tribal concern. More information on the aforementioned tribal concerns, is provided in Section 4.3.8.1.

3.2.8.3.1 Locations and Resources of Concern to Native American Tribes (Cultural Resources Inventory Summary)

Based on previous tribal consultation, resources of potential tribal importance are known to include stone circles/rock alignments, lodges, rock art, human burial sites, rock cairns, and significant landforms. These cultural resources have the potential to become TCPs through consultation with the Native American tribes, as only the Native American tribes can make these determinations. Sites of potential tribal importance constitute 5 percent (n=70) of all sites identified during the literature search conducted for the Project. As stated in Section 3.2.2 , a total of 1,280 sites were identified in the Project study area during the literature search. Twenty-six percent (n=18) of the known sites with potential tribal importance have been recommended as not eligible for the NRHP, 20 percent (n=14) of the sites have been recommended as eligible for the NRHP, and 54 percent (n=38) of the sites were not evaluated for NRHP eligibility. The BLM will continue tribal consultation about sites of potential tribal importance regardless of NRHP eligibility. In some cases, information provided during tribal consultation could justify a change in NRHP eligibility. The occurrence of sites of potential tribal importance along each alternative route and route variation is presented in Table 3-67.

To facilitate comparison of alternative routes, numbers of potential additional sites were projected for each alternative route (Table 3-67). Site projections were calculated based on the average number of sites of tribal importance per 100 acres (site density) for those areas that previously have been inventoried within each 1-mile-wide corridor (Ollie et al. 2016). Table 3-67 presents the known numbers of sites of potential tribal importance within each 1-mile-wide corridor based on surveyed areas and the projected number of sites of potential tribal concern within each 1-mile-wide corridor based on the estimated site density. In addition, the projected number of sites of potential tribal importance in the direct effects APE was assessed by using the percentage of areas unsurveyed in each direct effects APE and applying the estimated site density to those areas and then adding these findings to the known site totals (Ollie et al.

2016). Site projections are not necessarily representative of all sites of potential tribal importance that may, or may not, be present in the Project study area. Site projections are listed and discussed in Section 4.3.8 and Table 4-68.

Sensitive areas, such as the Chimney Butte landscape (Alternative 1A: Proposed Action), the Boars Tusk landscape (Alternative 2B: Southern Route), and the Cedar Ridge TCP and periphery (Alternatives 3A: Proposed Action and 3B: Lost Creek to Lost Cabin), are in the Project study area. The Native American tribes have expressed that the Cedar Ridge TCP, the Chimney Butte landscape, and the Boars Tusk are reflective of the presence of highly sensitive landscapes, which are of great importance to their cultures. These landscapes are seen as living systems rather than a collection of artifacts and features, randomly demarcated sites, or disjointed resources (e.g., cultural material, plants, animals, and topographic features). The landscapes incorporate a series of interconnected physical and spiritual elements.

Based on the ratio of known sites of potential tribal importance, alternative routes in Segment 3 have more sites of potential tribal importance than those in Segments 1 and 2 (Table 3-67). This may be related to the proximity of the Rattlesnake Hills to Alternative 3A: Proposed Action and the Moneta Hills on the northern portion of Alternative 3B: Lost Creek to Lost Cabin. Although Alternatives 3B: Lost Creek to Lost Cabin and 3C: Lost Creek to Highway 20/26 overlap for much of their extent, the latter has fewer sites and lies farther away from the Moneta Hills. Of note, Alternative 1C: Figure Four has most of the known rock art sites across the Project study area and Alternative 2B: Southern Route is situated in proximity to a human burial site of unknown cultural affiliation (human burial sites are not well known in the Project study area).

The Native American tribes have expressed a connection with the types of resources (e.g., stone circles, rock cairns, rock art, and human burial sites) discussed in this section. As a result, potential impacts are not only limited to direct effects on these sites but can extend to the surrounding landscape.

3.2.8.3.1.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Alternative 1A: Proposed Action

Thirty percent of Alternative 1A: Proposed Action has been inventoried intensively for cultural resources. Cultural resources survey covered 5,937 acres of the 19,650 acres for the alternative route (Table 3-67). Five known sites of potential tribal importance were identified. Of these sites, 60 percent (n=3) have been recommended as not eligible for the NRHP and 40 percent (n=2) have been recommended as eligible for the NRHP. Site types include prehistoric rock art, prehistoric stone circles, and rock cairns of unknown cultural affiliation. There are no known sites of potential tribal importance in the direct effects APE. Class III inventory likely will result in more and/or different types of sites recorded. Projections of the number of sites of potential tribal concern that could be expected along Alternative 1A: Proposed Action based on existing data are provided in Section 4.3.8.5.

The Chimney Butte landscape has been identified as being of importance to several Native American tribes, including the Crow Creek Sioux Tribe, the Cheyenne River Sioux Tribe, and the Rosebud Sioux Tribe. This culturally sensitive landscape is situated approximately 0.3 mile to the northeast of Alternative 1A: Proposed Action. In addition, the Eastern Shoshone Tribe of the Wind River Reservation has expressed concern about Alternative 1A: Proposed Action crossing the Green River.

Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

Alternative 1A: Variations (Dry Basin Draw Proposed Action [1AP] and Dry Basin Draw Variation [1AV])

Ninety-six percent of Alternative 1AP Variation: Dry Basin Draw Proposed Action has been inventoried intensively for cultural resources. Cultural resources survey covered 2,072 acres of the 2,147 acres for the route variation (Table 3-67). Two known sites of potential tribal importance were identified, including one prehistoric stone circle and one potential prehistoric habitation site. Of a total of 2,320 acres for Alternative 1AV Variation: Dry Basin Draw Variation, 2,034 acres (88 percent) have been inventoried intensively for cultural resources (Table 3-67). Only one of the sites previously identified along Alternative 1AP Variation: Dry Basin Draw Proposed Action occurs within the boundaries of Alternative 1AV Variation: Dry Basin Draw. Class III inventory likely will result in more and/or different kinds of sites recorded. Projections of the number of sites of potential tribal concern that could be expected along these route variations based on existing data are provided in Section 4.3.8.5.

Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

Alternative 1B: Dry Piney

Forty-nine percent of Alternative 1B: Dry Piney has been inventoried intensively for cultural resources. Cultural resources survey covered 11,039 acres of the 22,355 acres for the alternative route (Table 3-67). Ten known sites of potential tribal importance were identified. Of these sites, 30 percent (n=3) have been recommended as not eligible for the NRHP, 10 percent (n=1) have been recommended as eligible for the NRHP, and 60 percent (n=6) were not evaluated for NRHP eligibility. Site types include prehistoric rock art, prehistoric stone circles, and rock cairns of unknown cultural affiliation. There are no known sites of potential tribal importance in the direct effects APE. Class III inventory likely will result in more and/or different kinds of sites recorded. Projections of the number of sites of potential tribal concern that could be expected along Alternative 1B: Dry Piney based on existing data are provided in Section 4.3.8.5.

The Eastern Shoshone Tribe of the Wind River Reservation has expressed concern about Alternative 1B: Dry Piney crossing the Green River.

Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

Alternative 1C: Figure Four

Seventy-seven percent of Alternative 1C: Figure Four has been inventoried intensively for cultural resources. Cultural resources survey covered 19,049 acres of the 24,738 acres for the alternative route (Table 3-67). Twenty-one known sites of potential tribal importance were identified. Of these sites, 24 percent (n=5) have been recommended as not eligible for the NRHP, 28 percent (n=6) have been recommended as eligible for the NRHP, and 48 percent (n=10) were not evaluated for NRHP eligibility. Site types include prehistoric and historic rock art, prehistoric rock cairns, prehistoric stone circles/rock alignments, and prehistoric human burial sites. Of the 21 known sites of potential tribal importance, 2 are in the direct effects APE. Class III inventory likely will result in more and/or different kinds of sites recorded. Projections of the number of sites of potential tribal concern that could be expected along Alternative 1C: Figure Four based on existing data are provided in Section 4.3.8.5.

The Eastern Shoshone Tribe of the Wind River Reservation has expressed concern about Alternative 1C: Figure Four crossing the Green River.

Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

Table 3-67
Summary of the Number of Sites of Potential Tribal Importance by Alternative Route and Route Variation

Alternative Route	Sites in the 1-mile Corridor										Sites in the Direct Effects Area of Potential Effects			
	Acres	Acres Survey	Percentage of Cultural Resources Survey Coverage	Average Number of Sites per 100 Acres Inventoried	Known Sites (National Register of Historic Places Eligibilities)				Total Number of Known Sites	Total Number of Known and Projected Sites[1]	Total Acres	Percentage of Cultural Resources Survey Coverage	Known Sites	Known and Projected Sites[2]
					NRHP-Eligible	Not Eligible	Unevaluated	NRHP-Listed Properties						
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant														
1A: Proposed Action	19,650	5,937	30	2.59	2	3	0	0	5	17	736	45	0	0
1AP Variation: Dry Basin Draw Proposed Action[3]	2,147	2,072	96	1.4	1	1	0	0	2	2	63	81	0	0
1AV Variation: Dry Basin Draw Variation[3]	2,320	2,034	88	1.6	0	1	0	0	1	1	71	41	0	0
1B: Dry Piney	22,355	11,039	49	1.38	1	3	6	0	10	20	836	41	0	0
1C: Figure Four	24,738	19,049	77	1.35	6	5	10	0	21	27	931	63	2	2
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect														
2A: Proposed Action	82,757	5,160	6	4.57	1	0	2	0	3	48	3,131	23	0	0
2B: Southern Route	87,502	6,647	8	3.54	2	1	3	0	6	79	3,303	17	1	2
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect														
3A: Proposed Action	53,553	10,247	19	2.24	5	9	12	0	26	136	2,018	27	4	6
3B: Lost Creek to Lost Cabin	47,029	12,614	27	2.12	2	8	14	0	24	89	1,770	36	3	4
3C: Lost Creek to Highway 20/26	65,215	15,615	24	2.29	1	7	8	0	16	67	2,460	42	2	3

NOTES:
[1]Site projections were calculated based on the average number of sites per 100 acres (site density) for those areas that have been previously inventoried within each 1-mile-wide corridor (Ollie et al. 2016). Site projections are discussed in Section 4.3.8.5.
[2]The projected number of sites in the direct effects APE was assessed by using the percentage of areas unsurveyed in each direct effects APE and applying the estimated site density to those areas and adding these findings to the known site totals (Ollie et al. 2016). Site projections are discussed in Section 4.3.8.5.
[3]As per cultural analysis presented in Ollie et al. 2016.

3.2.8.3.1.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Alternative 2A: Proposed Action

Six percent of Alternative 2A: Proposed Action has been inventoried intensively for cultural resources. Cultural resources survey covered 5,160 acres of the 82,757 acres for the alternative route (Table 3-67). Three known sites of potential tribal importance were identified. Of these sites, 33 percent (n=1) have been recommended as eligible for the NRHP and 67 percent (n=2) were not evaluated for NRHP eligibility. Site types include potential prehistoric habitation sites and a possible lodge site. There are no known sites of potential tribal importance in the direct effects APE. Class III inventory likely will result in more and/or different kinds of sites recorded. Projections of the number of sites of potential tribal concern that could be expected along Alternative 2A: Proposed Action based on existing data are provided in Section 4.3.8.5.

The Arapahoe and Lost Creek site (48SW4882), which is listed in the NRHP for its scientific information potential, is crossed by this alternative route. Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

Alternative 2B: Southern Route

Eight percent of Alternative 2B: Southern Route has been inventoried intensively for cultural resources. Cultural resources survey covered 6,647 acres of the 87,502 acres for the alternative route (Table 3-67). Five known sites of potential tribal importance and one location (Boars Tusk) of tribal concern were identified. Of these sites, 17 percent (n=1) have been recommended as not eligible for the NRHP, 33 percent (n=2) have been recommended as eligible for the NRHP, and 50 percent (n=3) were not evaluated for NRHP eligibility. Site types include prehistoric stone rings/rock alignments, prehistoric rock cairns, a prehistoric human burial site, a possible lodge, and the previously mentioned Boars Tusk. Of these sites, only one is in the direct effects APE. The Boars Tusk is located approximately 128 meters (in the indirect effects APE) north of the centerline of this alternative route. Class III inventory likely will result in more and/or different kinds of sites recorded. Projections of the number of sites of potential tribal concern that could be expected along Alternative 2B: Southern Route based on existing data are provided in Section 4.3.8.5.

The Boars Tusk and its surroundings are considered to be a culturally significant landscape by the Shoshone-Bannock Tribes of the Fort Hall Reservation, the Eastern Shoshone Tribe of the Wind River Reservation, the Northern Arapaho Tribe of the Wind River Reservation, and the Ute Indian Tribe of the Uintah and Ouray Reservation. The proximity of the Project to the Boars Tusk is of great concern to the Native American tribes.

The Arapahoe and Lost Creek site (48SW4882), the West Sand Dunes Archaeological District, and the Greater Sand Dunes ACEC are in the direct effects APE along this alternative route. Additionally, there is a high potential for unrecorded archaeological and historic sites that may be relevant to the Native American tribes to occur in and adjacent to these resources.

The White Mountain Petroglyphs ACEC is located 4 miles to the south of this alternative route, outside of the Project study area. The petroglyphs are important resources to the Shoshone-Bannock Tribes of the Fort Hall Reservation, Northern Arapaho Tribe of the Wind River Reservation, Eastern Shoshone Tribe of the Wind River Reservation, and Ute Indian Tribe of the Uintah and Ouray Reservation.

Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

3.2.8.3.1.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Alternative 3A: Proposed Action

Nineteen percent of Alternative 3A: Proposed Action has been inventoried intensively for cultural resources. Cultural resources survey covered 10,247 acres of the 53,553 acres for the alternative route (Table 3-67). Twenty-six known sites of potential tribal importance were identified. Of these sites, 35 percent (n=9) have been recommended as not eligible for the NRHP, 19 percent (n=5) have been recommended as eligible for the NRHP, and 46 percent (n=12) were not evaluated for NRHP eligibility. Site types include prehistoric rock cairns, prehistoric stone circles/rock alignments, a possible lodge site, and a historic rock art site (inscriptions). Of the 26 known sites of potential tribal importance, 4 are in the direct effects APE. Class III inventory likely will result in more and/or different kinds of sites recorded. Projections of the number of sites of potential tribal concern that could be expected along Alternative 3A: Proposed Action based on existing data are provided in Section 4.3.8.5.

Based on tribal consultation, cultural resources related to the Cedar Ridge TCP are located along this alternative route. This Native American spiritual and sacred site is eligible for the NRHP and has special protections under the Casper and Lander RMPs. The Cedar Ridge TCP is a sacred place for the Eastern Shoshone Tribe of the Wind River Reservation, the Northern Arapaho Tribe of the Wind River Reservation, the Crow Tribe, the Northern Cheyenne Tribe, and, possibly, other Native American tribes. It was established as a TCP in 1997 after extensive consultation with the Eastern Shoshone Tribe and the Wyoming SHPO. This site is archaeologically significant in that it contains numerous stone circles and other rock alignments, cairns, and extensive evidence of prehistoric activity, both on Cedar Ridge proper and in its outlying areas. The Native American tribes stressed that along this alternative route, significant cultural resources are present that are part of a larger culturally significant landscape stretching from Cedar Ridge to the Gas Hills.

Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

Alternative 3B: Lost Creek to Lost Cabin

Twenty-eight percent of Alternative 3B: Lost Creek to Lost Cabin has been inventoried intensively for cultural resources. Cultural resources survey covered 12,614 acres of the 47,029 acres for the alternative route (Table 3-67). Twenty-four known sites of potential tribal importance were identified. Of these sites, 33 percent (n=8) have been recommended as not eligible for the NRHP, 8 percent (n=2) have been recommended as eligible for the NRHP, and approximately 59 percent (n=14) were not evaluated for NRHP eligibility. Site types include prehistoric and historic rock art, potential prehistoric stone circles/rock alignments, a possible lodge site, and a prehistoric human burial site of unknown cultural affiliation. Of the 24 known sites of potential tribal importance, 3 are in the direct effects APE. Class III inventory likely will result in more and/or different types of sites recorded. Projections of the number of sites of potential tribal concern that could be expected along Alternative 3B: Lost Creek to Lost Cabin based on existing data are provided in Section 4.3.8.5.

An additional record search identified the Cedar Ridge TCP in the vicinity of Alternative 3B: Lost Creek to Lost Cabin. The Cedar Ridge TCP lies approximately 5 miles to the northeast of this alternative route, outside of the Project area. Alternative 3B: Lost Creek to Lost Cabin would be acceptable to Native American tribes as long as the route followed the existing Lost Creek Pipeline route, although micro-siting may be necessary to avoid sites of importance to the Native American tribes.

Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

Alternative 3C: Lost Creek to Highway 20/26

Twenty-four percent of Alternative 3C: Lost Creek to Highway 20/26 has been inventoried intensively for cultural resources. Cultural resources survey covered 15,615 acres of the 65,215 acres for the alternative route (Table 3-67). Sixteen known sites of potential tribal importance were identified. Of these sites, 44 percent (n=7) have been recommended as not eligible for the NRHP, 6 percent (n=1) have been recommended as eligible for the NRHP, and 50 percent (n=8) were not evaluated for NRHP eligibility. Site types include prehistoric rock cairns, potential prehistoric habitations, prehistoric stone circles, and a possible lodge site. Of the 16 known sites of potential tribal importance, 2 are in the direct effects APE. Class III inventory likely will result in more and/or different types of sites recorded. Projections of the number of sites of potential tribal concern that could be expected along Alternative 3C: Lost Creek to Highway 20/26 based on existing data are provided in Section 4.3.8.5.

The Cedar Ridge TCP lies approximately 9 miles to the north of Alternative 3C: Lost Creek to Highway 20/26, outside of the Project area.

Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

3.2.9 Noise

Noise is generally defined as unwanted sound, and can be intermittent or continuous, steady or impulsive, stationary or transient. Noise levels heard by humans and animals are dependent on several variables, including distance and ground cover between the source and receiver and atmospheric conditions. Perception of noise is affected by intensity, frequency, pitch and duration. Project noise sources will include construction and drilling equipment and blasting, if necessary, during the construction of the pipeline and the Riley Ridge Sweetening Plant, and the ongoing Riley Ridge Sweetening Plant operations.

3.2.9.1 Regulatory Framework

Because of the Noise Control Act of 1972, the EPA developed acceptable noise levels under various conditions that would protect public health and welfare with an adequate margin of safety. The EPA identified outdoor L_{dn} noise levels less than or equal to 55 dBA are sufficient to protect public health and welfare in residential areas and other places where quiet is a basis for use (EPA 1978). Although the EPA guideline is not an enforceable regulation, it is a commonly accepted target noise level for environmental noise studies.

The study corridor is in Sublette, Sweetwater, Fremont, and Natrona counties, including the rural communities of Jeffrey City, Moneta, Lost Cabin, Hiland and Powder River. A review of existing federal, state, county, and local noise regulations, ordinances, and guidelines was conducted and used to establish significance criteria for assessing Project compliance at identified noise sensitive receptors (e.g., residences, schools, churches, recreation areas, campgrounds, WSAs, sage grouse leks, etc.). Table 3-68 lists the applicable Project noise regulations. Unless listed, other nuisance regulations are not applicable to the Project.

Table 3-68
Project Noise Regulations

Regulatory Authority[1]	Applicable Noise Regulations	Statute/Regulation
Environmental Protection Agency	▪ Outdoor L_{dn} noise levels less than or equal to 55 dBA are sufficient to protect public health and welfare in residential areas and other places where quiet is a basis for use.	Noise Control Act of 1972
State of Wyoming	▪ Mufflers are required on vehicles to prevent excessive noise.	Wyoming Statutes Annotated 31-5-953
State of Wyoming	▪ Noise: New project noise levels (individual or cumulative) should not exceed an L_{50} noise level that is 10 dBA above the baseline ambient noise level (L_{90}) at a lek perimeter from 6:00 p.m. to 8:00 a.m. during breeding season (March 1 to May 15) in core population areas. ▪ Surface Occupancy: No Surface Occupancy (NSO) within 0.6 mile of perimeter of occupied leks in core population areas, and within 0.25 mile in non-core population areas. However, underground utilities may be permissible if installation is completed outside applicable seasonal stipulation periods. ▪ Seasonal Use: Activities allowed July 1 to March 14 outside 0.6-mile perimeter of occupied lek in core population areas, and 0.25 mile of non-core population areas, where breeding, nesting and early brood-rearing habitat is present. In non-core areas, 2-mile seasonal buffer from March 15 to June 30 to occupied leks where breeding, nesting and early brood-rearing habitat is present. Production and maintenance activities are exempt from seasonal use stipulations.	Wyoming Executive Order 2015-4, Greater Sage-Grouse Core Area Protection
Bureau of Land Management	▪ Noise levels at the perimeter of the greater sage-grouse lek should not exceed 10 dBA above ambient noise (L_{90} 20 to 24 dBA) in priority habitat.	Wyoming 9 Plan – Wyoming Sage-grouse Land Use Plan Amendment and Final EIS
Sublette County	▪ No use shall be operated so that noise is perceptible beyond the property boundaries. Intermittent noise from vehicles and similar equipment in private use, temporary construction operations, and uses in the commercial and industrial land-use districts (C-1, CH-1, I-L, and I-H) are exempt.	Sublette County Zoning and Development Regulations, Chapter III - Development Standards, Section 14
Sweetwater County	▪ Noise level restrictions: Maximum sound level of 70 dBA at the property line in commercial/industrial zoning districts and 60 dBA in residential districts. Temporary construction or maintenance activities are exempt during daytime hours of 7:00 a.m. to 10:00 p.m. Noise from permitted industrial facility or oil and gas or mining operation is not considered a public nuisance.	Sweetwater County 2014 Zoning Resolution, Section 18, Nuisance Regulations

Table 3-68 Project Noise Regulations		
Regulatory Authority[1]	**Applicable Noise Regulations**	**Statute/Regulation**
Natrona County	▪ Any use that is operated so that noise is perceptible beyond the boundaries of the property, provided that this standard shall not apply to incidental traffic, parking, loading, construction, farming or maintenance operations. ▪ Any use which creates earth-shaking vibrations, if such vibrations are perceptible beyond the boundaries of the property, provided that this standard shall not apply to vibrations created during the process of construction.	2000 Natrona County Zoning Resolution, Section 7, Nuisance Standards and Storage Requirements
SOURCES: BLM 2015a, EPA 1978, Natrona County 2015, Sublette County 2011, Sweetwater County 2014, NOTE: [1] Fremont County and the rural communities of Jeffrey City, Moneta, Lost Cabin, Hiland and Power River do not have applicable noise regulations or ordinances.		

The Federal Transit Administration (FTA) has developed guidelines for assessing short (1-hour) and long-term (8-hour) construction activities. Assessment of construction noise includes evaluating the existing ambient noise environment, the absolute noise levels due to construction activities, the duration of construction, and the noise-sensitivity of the adjacent land use. Table 3-69 summarizes the FTA construction noise guidelines at adjacent land uses. If these guidelines are exceeded, adverse community reaction may result.

Table 3-69 Federal Transit Administration Construction Noise Guidelines		
Adjacent Land Use	**Daytime L_{eq}**	**Nighttime L_{eq}**
Short Duration Noise Guidelines (1 hour)		
Residential	90 dBA	80 dBA
Commercial	100 dBA	100 dBA
Industrial	100 dBA	100 dBA
Moderate Duration Noise Guidelines (8 hours)		
Residential	80 dBA	70 dBA
Commercial	85 dBA	85 dBA
Industrial	90 dBA	90 dBA
SOURCE: FTA 2006		

3.2.9.2 Regional Setting

The study corridor includes a diverse landscape with rural residential, open rangeland, agricultural and recreational land uses, as well as industrial, mining, oil and gas, and energy development. The Proposed Action and alternative routes cross highways and county roads and pass through or terminate at the rural communities (population less than 75) of Jeffrey City, Moneta, Lost Cabin, Hiland and Powder River. Recreational uses include fishing, hiking, hunting, camping, photography, wildlife viewing, and off-highway vehicle (OHV) activities. As documented in Section 3.2.23, numerous wildlife species, including the greater sage-grouse also inhabit the study corridor.

3.2.9.3 Existing Sound Levels and Noise Sensitive Receptors

Existing man-made noise sources in the study corridor include vehicle and train traffic, industrial, residential, agricultural and recreational activities, mining, oil, gas and energy production, and aircraft flyovers. Natural sound sources include wind, wildlife, birds, insects and flowing water. Noise receptors in the study corridor include residences, recreation areas, fishing access sites, campgrounds, schools,

churches, WSAs, greater sage-grouse, and other noise-sensitive wildlife species documented in Section 3.2.23.

The existing ambient sound levels throughout the Project area are estimated to be approximately L_{90} 20 dBA and L_{dn} 40-45 dBA, which is typical for sparsely populated, rural locations that are predominantly natural (Harris 1998, EPA 1978). The L_{90} 20 dBA baseline ambient noise level for this Project is based on the ambient noise level used in the Wyoming 9 Plan and the measured ambient noise levels at 19 sage-grouse leks over multiple days in the Pinedale Anticline Project Area (Ambrose and Florian 2013). As shown in Table 3-70, sound levels at receptors located adjacent to existing roadways are intermittently higher due to vehicles passing by. Receptors located near existing man-made industrial sources, such as compressor stations, extraction wells and Central Gathering Facilities, have higher ambient sound levels depending on the distance, terrain, and number of noise sources in the vicinity of the receptor.

Table 3-70
Existing Source Sound Levels

Source	Estimated Sound Level at Specified Distance
Car passing by at 60 mph	L_{max} 75 dBA at 50 feet
Heavy truck passing by at 60 mph	L_{max} 85 dBA at 50 feet
Extraction well with generator	L_{eq} 47 dBA at 328 feet
Extraction well without generator	L_{eq} 35 dBA at 328 feet
Compressor Station	L_{eq} 52 dBA at 460 feet
Central Gathering Facility	L_{eq} 46 dBA at 500 feet

SOURCES: Ambrose and Florian 2013, USDOT 1998

3.2.9.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Primary noise sources in Segment 1 of the Project include the Riley Ridge Treatment Plant operations, intermittent vehicle traffic on county roads and Highway 189, compressor stations, extraction wells, mine and gravel pit operations, and residential activities. Natural sound sources include wind, wildlife, birds, insects, the Green River and flowing water in intermittent creeks.

Noise-sensitive receptors located within 2.0 miles of the Segment 1 alternative pipeline routes were determined using aerial photography and GIS data (BLM 2010a, 2013c; SWCA 2013). Table 3-71 lists the identified human noise-sensitive receptors including 7 ranches, 9 single family residences, 1 mobile home and 3 Green River fishing access sites. Noise-sensitive wildlife species are documented in Section 3.2.23.

3.2.9.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Primary noise sources in Segment 2 of the Project include vehicle traffic on county roads, Highway 189 and Wyoming 28, a rail line, a landing strip, compressor stations, and residential, agricultural, rangeland and recreational activities. Natural sound sources include wind, wildlife, birds, insects, and flowing water in area creeks and rivers.

Segment 2 is sparsely populated with little industrial development. Noise-sensitive receptors located within 2.0 miles of the Segment 2 alternative pipeline routes were determined using aerial photography and GIS data (BLM 2013c, SWCA 2013).

Table 3-72 lists the identified human noise-sensitive receptors including two ranches, Big Sandy and Eden reservoirs, the Killpecker Sand Dunes Campground with OHV recreation, and WSAs. Noise-sensitive wildlife species are documented in Section 3.2.23.

Table 3-71
Noise Sensitive Receptors within 2 miles of Alternative Routes in Segment 1

Receptor(s)[1]	1A: Proposed Action[2]			1B: Dry Piney			1C: Figure Four		
	Distance (feet)	Direction from Route	Approximate Milepost	Distance (feet)	Direction from Route	Approximate Milepost	Distance (feet)	Direction from Route	Approximate Milepost
Ranch[3]	6,900	North	2.0	6,900	North	2.0	6,900	North	2.0
Single Family Residence	900	North	4.7	900	North	4.7	900	North	4.7
Mobile Home	1,300	Northwest	5.3	1,300	Northwest	5.3	1,300	Northwest	5.3
Ranch[3]	10,050	North	6.0	10,050	North	6.0	10,050	North	6.0
Ranch[3]	8,200	Northeast	8.1	8,200	Northeast	8.1	8,200	Northeast	8.1
Single Family Residence	7,400	Northeast	8.2	7,400	Northeast	8.2	7,400	Northeast	8.2
Ranch[3]	7,600	Northeast	8.2	7,600	Northeast	8.2	7,600	Northeast	8.2
Ranch[3]	9,000	Northeast	8.2	9,000	Northeast	8.2	9,000	Northeast	8.2
Ranch[3]	2,200	South	20.3	2,200	South	24.5	–	–	–
South Long Island Green River Fishing Access Site[4]	800	Northeast	21.0	800	Northeast	25.2	–	–	–
North Long Island Green River Fishing Access Site	3,100	Northeast	21.0	3,100	Northeast	25.2	–	–	–
Five Single Family Residences (Calpet)	–	–	–	–	–	–	9,900	South	22.7
Single Family Residence	–	–	–	–	–	–	9,200	Southwest	26.7
North La Barge Green River Fishing Access Site	–	–	–	–	–	–	7,500	South	26.7
Single Family Residence	–	–	–	–	–	–	4,600	Southeast	27.0
Ranch[3, 4]	–	–	–	–	–	–	1,600	North	28.7

SOURCES: Google Earth Pro Version 7.1.2.2041, BLM 2013c, SWCA 2013
NOTES:
[1]All receptors located in Sublette County
[2]No receptors are located within 2 miles of Alternative 1A Variation: Dry Basin Draw.
[3]A ranch property may contain more than one occupied residence.
[4]Closest receptor to Green River HDD location.

Table 3-72
Noise Sensitive Receptors within 2 Miles of Alternative Routes in Segment 2

Receptor[1]	2A: Proposed Action			2B: Southern Route		
	Distance (feet)	Direction from Route	Approximate Milepost	Distance (feet)	Direction from Route	Approximate Milepost
Big Sandy Reservoir[2,6]	9,400	Southwest	33.2	–	–	–
Eden Reservoir[3]	8,900	Southwest	37.8	–	–	–
Ranch[4]	2,600	Northeast	48.0	–	–	–
Ranch[4]	–	–	–	7,300	North	42.6
Buffalo Hump WSA[7]	–	–	–	3,700	North	51.3
Sand Dunes WSA[7]	–	–	–	100	North	54
Alkali Draw WSA[7]	100	South	69.5	9,500	North	78
Killpecker Sand Dunes Campground[5]	–	–	–	7,000	North	62.2
South Pinnacles WSA[7]	–	–	–	1,056	North	81.8
Alkali Basin/East Sand Dunes WSA[7]	–	–	–	2,800	Southeast	82.4

SOURCES: Google Earth Pro Version 7.1.2.2041, BLM 2013c, SWCA 2013
NOTES:
[1]All receptors are in Sweetwater County except Big Sandy Reservoir.
[2]Camping, fishing, hiking, and boating uses. Located in Sublette County.
[3]Fishing and hiking uses.
[4]A ranch property may contain more than one occupied residence.
[5]Campground and OHV uses.
[6]Closest receptor to Big Sandy River HDD location.
[7]Refer to Section 3.2.16.4 for recreational uses of WSAs.

3.2.9.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Primary noise sources in Segment 3 of the Project include vehicle traffic on county roads, Highway 287, Highway 20/26 and Wyoming 136, compressor stations, extraction wells, industrial facilities, landing strips, aircraft flyovers, mine and gravel pit operations, a wind farm and activities associated with the rural communities of Jeffrey City, Moneta, Lost Cabin, Hiland and Powder River. Natural sound sources include wind, wildlife, birds, insects and flowing water in area creeks.

Noise-sensitive receptors located within 2.0 miles of the Segment 3 alternative routes were determined using aerial photography and GIS data (BLM 2010a, BLM 2013c). Segment 3 is the most populated segment, and Table 3-73 lists the identified human noise-sensitive receptors located along each alternative route. Receptors vary between alternative routes and include ranches, mobile homes, apartments, single family residences, schools, churches, and fishing sites. Noise-sensitive wildlife species are documented in Section 3.2.23.

Table 3-73
Noise Sensitive Receptors within 2 Miles of Alternative Routes in Segment 3

Receptor(s)	3A: Proposed Action			3B: Lost Creek to Lost Cabin			3C: Lost Creek to Highway 20/26		
	Distance (feet)	Direction from Route	Approximate Milepost	Distance (feet)	Direction from Route	Approximate Milepost	Distance (feet)	Direction from Route	Approximate Milepost
South of Jeffrey City[1]									
Ranch[3]	2,200	East	5.4	2,200	East	5.4	2,200	East	5.4
Mobile Home	4,500	Southeast	6.5	4,500	Southeast	6.5	4,500	Southeast	6.5
Jeffrey City[1]									
Church	2,350	North	10.5	2,350	North	10.5	2,350	North	10.5
Single Family Residence	4,100	North	10.4	4,100	North	10.4	4,100	North	10.4
Ranch[3]	440	East	11.4	440	East	11.4	440	East	11.4
13 Mobile Homes	1,000 to 2,500	East	11.8	1,000 to 2,500	East	11.8	1,000 to 2,500	East	11.8
Apartment	1,000	East	11.8	1,000	East	11.8	1,000	East	11.8
Four Single Family Residences	1,100 to 1,700	East	11.8	1,100 to 1,700	East	11.8	1,100 to 1,700	East	11.8
School	910	East	11.8	910	East	11.8	910	East	11.8
Church	1,665	East	11.8	1,665	East	11.8	1,665	East	11.8
10 Single Family Residences	1,100 to 2,200	West	11.8	1,100 to 2,200	West	11.8	1,100 to 2,200	West	11.8
Single Family Residence	2,200	East	12.4	2,200	East	12.4	2,200	East	12.4
Mobile Home	1,500	East	12.4	1,500	East	12.4	1,500	East	12.4
Ranch[3]	2,100	East	12.4	2,100	East	12.4	2,100	East	12.4
North of Jeffrey City[1]									
Ranch[3,4]	4,150	East	14.7	4,150	East	14.7	4,150	East	14.7
Ranch[3]	7,600	East	16.3	7,600	East	16.3	7,600	East	16.3
Ranch[3]	–	–	–	70	East	55.9	70	East	55.9
Moneta[1]									
Ranch[3]	–	–	–	2,850	West	61.0	2,850	West	61.0

Table 3-73
Noise Sensitive Receptors within 2 Miles of Alternative Routes in Segment 3

Receptor(s)	3A: Proposed Action			3B: Lost Creek to Lost Cabin			3C: Lost Creek to Highway 20/26		
	Distance (feet)	Direction from Route	Approximate Milepost	Distance (feet)	Direction from Route	Approximate Milepost	Distance (feet)	Direction from Route	Approximate Milepost
Lost Cabin[1]									
Four Single Family Residences	–	–	–	6,200 to 6,400	Northwest	72.5	–	–	–
Hwy 20/26[2]									
Ranch[3]	–	–	–	–	–	–	260	North	79.2
Single Family Residence (Hiland)	–	–	–	–	–	–	160	Northeast	80.3
Three Mobile Homes	–	–	–	–	–	–	320 to 700	West	81.1
Three Mobile Homes	–	–	–	–	–	–	701 to 1,050	West	81.1
Ranch[3]	–	–	–	–	–	–	360	South	86.7
Single Family Residence	–	–	–	–	–	–	300	North	89.0
Mobile Home	–	–	–	–	–	–	1,250	North	92.0
Ranch[3]	–	–	–	–	–	–	2,650	Southwest	98.4
Burlington Reservoir[5]	–	–	–	–	–	–	6,100	Northeast	98.4
Natrona County[2]									
Ranch[3]	900	South	52	–	–	–	–	–	–
Christine Lake[5]	1,500	North	55.3	–	–	–	–	–	–
Ranch[3]	980	South	72.7	–	–	–	–	–	–
Powder River[2]									
Seven Single Family Residences	5,100 to 7,100	Northwest	83.2	–	–	–	140 to 700	North	100.1

Table 3-73
Noise Sensitive Receptors within 2 Miles of Alternative Routes in Segment 3

Receptor(s)	3A: Proposed Action			3B: Lost Creek to Lost Cabin			3C: Lost Creek to Highway 20/26		
	Distance (feet)	Direction from Route	Approximate Milepost	Distance (feet)	Direction from Route	Approximate Milepost	Distance (feet)	Direction from Route	Approximate Milepost
Seven Single Family Residences	5,100 to 7,100	Northwest	83.2	–	–	–	701 to 2,100	North	100.1
Four Mobile Homes	4,900 to 6,150	Northwest	83.2	–	–	–	250 to 700	North	100.1
Three Mobile Homes	4,900 to 6,150	Northwest	83.2	–	–	–	701 to 1,750	North	100.1
School	6,850	Northwest	83.2	–	–	–	1,450	North	100.1

SOURCES: Google Earth Pro Version 7.1.2.2041, BLM 2013

NOTES:

[1]Receptors located in Fremont County.
[2]Receptors located in Natrona County.
[3]A ranch property may contain more than one occupied residence.
[4]Closest receptor to Sweetwater River HDD location.
[5]Fishing use.

3.2.10 Lands with Wilderness Characteristics

This section discusses inventoried lands that have been documented to contain wilderness characteristics in the study area. In general, lands with wilderness characteristics units are public lands outside of WSAs and designated wilderness areas that are greater than 5,000 acres of contiguous public lands with (1) apparent naturalness, (2) outstanding opportunities for either solitude or primitive and unconfined recreation, or (3) possible supplemental values.

3.2.10.1 Regulatory Framework

Laws, regulations, and policies that establish and provide overall direction for the management of lands with wilderness characteristics are described in this section.

- FLPMA of 1976 (P.L. 94-579, Section 603), Section 201 requires the BLM to maintain on a continuing basis an inventory of all public lands and their resources and other values. This inventory requirement includes maintaining information regarding wilderness characteristics. Section 201 also directs that the preparation and maintenance of the inventory will not change or prevent change of the management or use of the lands.

  Section 202 of FLPMA requires the BLM to rely on the resource inventories in the development and revision of land-use plans, including inventory information regarding wilderness characteristics.

  The potential effects of a Proposed Action on the wilderness characteristics and compliance with management-level decisions (established in BLM RMPs) for the areas must be considered by the BLM when making project-level decisions.
- BLM Manual 6310 – Conducting Wilderness Characteristics Inventory on BLM Lands (Public) states that for lands with wilderness characteristics "This policy contains the BLM guidance and general procedure for conducting wilderness characteristics inventories under Section 201 of FLPMA and supersedes all previous guidance on this topic." Under this policy the BLM will conduct inventories of public lands for the presence or absence of wilderness characteristics, by considering the, "…validity of proposed boundaries of the area(s), the existence of wilderness inventory roads and other boundary features, the size of the area(s), and the presence or absence of wilderness characteristics." Once potential lands with wilderness characteristics units have been identified, a complete inventory performed, where the BLM considers the size, naturalness, and outstanding opportunities for solitude or a primitive and unconfined type of recreation, as well as any supplemental values. If an inventory meets these criteria, the area is documented as containing wilderness characteristics (BLM 2012b).
- BLM Manual 6320 considers lands with wilderness characteristics in the BLM Land Use Planning Process (Public) and establishes BLM policy on considering lands with wilderness characteristics in land-use plans and land-use plan amendments and revisions in accordance with FLPMA and other applicable authorities. By using the land-use planning process, the BLM can determine how to manage the lands with wilderness characteristics as part of the BLM's multiple-use mandate. A NEPA document will be completed to reach a planning decision for these units, outlining the management actions with allowable uses and restrictions (i.e., right-of-way exclusion or avoidance area [BLM 2012c]).

For the BLM field offices (Pinedale, Rock Springs, Rawlins, Lander, and Casper) in the study area (i.e., a 2-mile-wide study corridor), the applicable RMPs provide management objectives and prescriptions for specific lands with wilderness characteristics areas.

- The BLM Pinedale Field Office completed inventories for lands with wilderness characteristics units in January and September of 2013. The field office has not yet conducted planning for revising their RMP with management for some of these areas.
- The BLM Rock Springs Field Office completed inventories of lands with wilderness characteristics units in December of 2014. The field office is currently revising their RMP with management for some of the areas. However, a planning decision is not anticipated until 2018.
- In the BLM Rawlins Field Office, inventories of lands with wilderness characteristics have been completed. After a public planning process, the decision was to manage the units for multiple-use per the Rawlins RMP. This is further clarified on page 2-11 of the Proposed Rawlins Field Office RMP/Final EIS and reads as follows: "Because the BLM found the lands to be unmanageable for wilderness character because of preexisting oil and gas leases, the BLM elected to manage lands with wilderness character for multiple-use and not for protection of wilderness character. Accordingly, measures to provide protection for any wilderness characteristics of lands (outside of previously established WSAs) will not be considered in the alternatives in this RMP. This is consistent with BLM policy as presented in BLM IM 2003-275."
- The BLM Lander Field Office completed inventories for lands with wilderness characteristics units and addressed management through a public planning process for their 2014 RMP revision. The decision was to manage the units to "maintain existing wilderness characteristics associated with identified areas (outside of WSAs) found to contain wilderness characteristics."
- BLM Casper Field Office has identified the 5,000-acre blocks of land with potential lands with wilderness characteristics. The field office has not yet conducted planning for revising their RMP with management for some of these areas.

3.2.10.2 Regional Setting

Lands with wilderness characteristics in the BLM Pinedale, Rock Springs, Rawlins, and Casper Field Offices occur in the study area. There are no lands with wilderness characteristics in the 2-mile-wide study area in the Lander Field Office.

3.2.10.3 Lands with Wilderness Characteristics Units by Segment

3.2.10.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Table 3-74 below describes inventoried lands with wilderness characteristics in Segment 1. No lands with wilderness characteristics are located within the 2-mile-wide study corridor in the Casper, Lander, or Rawlins Field Offices in Segment 1.

Table 3-74
Inventoried Lands with Wilderness Characteristics in Segment 1

Unit ID/ Name	Approximate Unit Size[1] (acres)	Meets LWC?	Wilderness Inventory Characteristic Values					BLM Management Decision?	Crossed by Centerline of Alternative Route?
			Sufficient Size	Naturalness	Solitude	Primitive and Unconfined Recreation	Supplemental Values		
Rock Springs Field Office									
WY040-2011-134	153,544	No	No	Not applicable					Yes, Alternative 1A: Proposed Action
WY040-2011-135	37,929	No	No	Not applicable					Yes, Alternative 1A: Proposed Action
Pinedale Field Office									
WYD01-6300-0000[1]	31,030	No	No	Not applicable					Yes, Alternative 1A: Proposed Action
WYD01-6300-205	10,730	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
WYD01-6300-206	29,904	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
WYD01-6300-300	134,821	No	No	Not applicable					Yes, Alternative 1A: Proposed Action and variation, Alternative 1B: Dry Piney, and Alternative 1C: Figure Four
WYD01-6300-305	8,421	No	No	Not applicable					Yes, Alternative 1A: Proposed Action, Alternative 1B: Dry Piney, and Alternative 1C: Figure Four

NOTE: [1]This acreage represents the sum of the area of approximately 425 parcels that were all named WYD01-6300-0000

3.2.10.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Table 3-75 describes inventoried lands with wilderness characteristics in Segment 2.

Table 3-75
Inventoried Lands with Wilderness Characteristics in Segment 2

Unit ID/ Name	Approximate Unit Size[1] (Acres)	Meets LWC?	Wilderness Inventory Characteristic Values					BLM Management Decision?	Crossed by Centerline of Alternative Route?
			Sufficient Size	Naturalness	Solitude	Primitive and Unconfined Recreation	Supplemental Values		
Rawlins Field Office									
Cyclone Rim North	36,500	No	Yes	No	Not applicable				No
Cyclone Rim South	6,896	No	Yes	No	Not applicable				Yes, Alternative 2A: Proposed Action and Alternative 2B: Southern Route
Eagle Nest East	23,302	No	Yes	No	Not applicable				No
Eagle Nest West	15,186	No	Yes	No	Not applicable				Yes, Alternative 2A: Proposed Action and Alternative 2B: Southern Route
Red Creek	15,946	No	Yes	No	Not applicable				No
RFO-A	7,629	No	No	Not applicable					Yes, Alternative 2A: Proposed Action and Alternative 2B: Southern Route
Rock Springs Field Office									
WY040-2011-059	8,014	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes, Alternative 2A: Proposed Action
WY040-2011-060	5,515	No	Yes	No	Not applicable				Yes, Alternative 2A: Proposed Action
WY040-2011-061	5,118	No	Yes	Yes	No	Not applicable			No
WY040-2011-065	18,636	No	Yes	No	Not applicable				No
WY040-2011-066	5,249	No	Yes	No	Not applicable				Yes, Alternative 2B: Southern Route
WY040-2011-068	7,234	No	Yes	No	Not applicable				No
WY040-2011-069	8,115	Yes	Yes	Yes	Yes	Yes	Yes	No	No, adjacent to County Road 21 at southern boundary
WY040-2011-073	5,600	No	Yes	No	Not applicable				No
WY040-2011-074	8,236	Yes	Yes	Yes	Yes	Yes	Yes	No	No, adjacent to County Road 21 at southern boundary
WY040-2011-076	7,952	No	Yes	Not applicable					Yes, Alternative 2A: Proposed Action
WY040-2011-077	16,442	No	Yes	No	Not applicable				No

Table 3-75
Inventoried Lands with Wilderness Characteristics in Segment 2

Unit ID/ Name	Approximate Unit Size[1] (Acres)	Meets LWC?	Wilderness Inventory Characteristic Values					BLM Management Decision?	Crossed by Centerline of Alternative Route?
			Sufficient Size	Naturalness	Solitude	Primitive and Unconfined Recreation	Supplemental Values		
WY040-2011-078	9,173	No	Yes	No	Not applicable				No
WY040-2011-079	6,201	No	Yes	Yes	Not applicable				No
WY040-2011-080	10,754	No	Yes	No	Not applicable				No
WY040-2011-081	6,158	No	Yes	No	Not applicable				Yes, Alternative 2B: Southern Route
WY040-2011-085	20,495	No	No	Not applicable					No
WY040-2011-100	19,685	No	Yes	No	Not applicable				No
WY040-2011-102	14,228	No	No	Not applicable					Yes, Alternative 2A: Proposed Action
WY040-2011-103	11,473	No	Not applicable						Yes, Alternative 2A: Proposed Action
WY040-2011-104	59,489	No	No	Not applicable					No
WY040-2011-105	33,221	No	No	Not applicable					Yes, Alternative 2A: Proposed Action
WY040-2011-106	16,089	No	No	Not applicable					Yes, Alternative 2A: Proposed Action and Alternative 2B: Southern Route
WY040-2011-107	27,857	No	No	Not applicable					Yes, Alternative 2A: Proposed Action
WY040-2011-109	15,834	No	No	Not applicable					Yes, Alternative 2A: Proposed Action
WY040-2011-110	15,000	No	No	Not applicable					Yes, Alternative 2B: Southern Route
WY040-2011-131	92,707	No	No	Not applicable					Yes, Alternative 2B: Southern Route
WY040-2011-133	112,368	No	No	Not applicable					Yes, Alternative 2B: Southern Route
WY040-2011-134	153,544	No	No	Not applicable					Yes, Alternative 2A: Proposed Action, Alternative 2B: Southern Route
WY040-2011-135	37,929	No	No	Not applicable					Yes, Alternative 2A: Proposed Action, Alternative 2B: Southern Route

Table 3-75
Inventoried Lands with Wilderness Characteristics in Segment 2

Unit ID/ Name	Approximate Unit Size[1] (Acres)	Meets LWC?	Wilderness Inventory Characteristic Values					BLM Management Decision?	Crossed by Centerline of Alternative Route?
			Sufficient Size	Naturalness	Solitude	Primitive and Unconfined Recreation	Supplemental Values		
WY040-2011-165	30,637	No	No	Not applicable					Yes, Alternative 2A: Proposed Action
WY040-2011-166	32,081	No	No	Not applicable					Yes, Alternative 2A: Proposed Action
WY040-2011-169	23,463	No	No	Not applicable					Yes, Alternative 2A: Proposed Action and Alternative 2B: Southern Route
WY040-2011-170	30,371	No	No	Not applicable					Yes, Alternative 2A: Proposed Action
WY040-2011-171	12,114	No	No	Not applicable					Yes, Alternative 2A: Proposed Action
WY040-2011-172	13,066	No	No	Not applicable					Yes, Alternative 2A: Proposed Action
WY040-2011-173	8,857	No	No	Not applicable					Yes, Alternative 2A: Proposed Action
WY040-2011-176	88,681	No	No	Not applicable					Yes, Alternative 2A: Proposed Action
WY040-2011-177	46,904	No	No	Not applicable					Yes, Alternative 2B: Southern Route
WY040-2011-178	8,349	No	No	Not applicable					Yes, Alternative 2B: Southern Route
WY040-2011-182	6,571	No	No	Not applicable					Yes, Alternative 2B: Southern Route
WY040-2011-185	359	No	No	Not applicable					No
WY040-2011-223	2,138	No	No	Not applicable					Yes, Alternative 2A: Proposed Action
WY040-2011-224	1,822	No	No	Not applicable					Yes, Alternative 2A: Proposed Action
WY040-2011-225	595	No	No	Not applicable					Yes, Alternative 2A: Proposed Action

Table 3-75
Inventoried Lands with Wilderness Characteristics in Segment 2

Unit ID/ Name	Approximate Unit Size[1] (Acres)	Meets LWC?	Wilderness Inventory Characteristic Values					BLM Management Decision?	Crossed by Centerline of Alternative Route?
			Sufficient Size	Naturalness	Solitude	Primitive and Unconfined Recreation	Supplemental Values		
WY040-2011-231	77	No	No	Not applicable					Yes, Alternative 2A: Proposed Action
WY040-2011-232	180	No	No	Not applicable					Yes, Alternative 2A: Proposed Action
WY040-2011-235	2,968	No	No	Not applicable					Yes, Alternative 2B: Southern Route
Pinedale Field Office									
WYD01-6300-0000	31,213[2]	No	No	Not applicable					Yes, Alternative 2A: Proposed Action and Alternative 2B: Southern Route
WYD01-6300-205	10,730	Yes	Yes	Yes	Yes	Yes	Yes	No	No
WYD01-6300-206	29,904	Yes	Yes	Yes	Yes	Yes	Yes	No	No
WYD01-6300-207	14,638	No	Not applicable						Yes, Alternative 2A: Proposed Action

NOTES:
[1]Although some units may initially meet the acreage requirement, inventory indicates that the area is divided or crossed by alternative routes or pipelines and, therefore, does not meet the size requirement.
[2]This acreage represents the sum of the area of approximately 425 parcels that were all named WYD01-6300-0000.

3.2.10.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Table 3-76 below describes inventoried lands with wilderness characteristics in Segment 3. No lands with wilderness characteristics occur in the 2-mile-wide study corridor in the Lander, Rawlins, Rock Springs, and Pinedale Field Offices in Segment 3.

Table 3-76
Inventoried Lands with Wilderness Characteristics in Segment 3

Unit ID/ Name	Approximate Unit Size[1] (Acres)	Meets LWC?	Wilderness Inventory Characteristic Values					BLM Management Decision?	Crossed by Centerline of Alternative Route?
			Sufficient Size	Naturalness	Solitude	Primitive and Unconfined Recreation	Supplemental Values		
Casper Field Office									
Square Top Butte	6,118	Not applicable							Yes, Alternative 3A: Proposed Action

NOTES:
[1]Although some units may initially meet the acreage requirement, inventory indicates that the area is divided or crossed by alternative routes or pipelines and, therefore, does not meet the size requirement.
Maps 13 and 14 from the Lander Resource Management Plan Revision Proposed Resource Management Plan and Final EIS – February 2013 indicate that the Little Red Creek Complex is the only LWC unit with wilderness characteristics in the Lander Field Office. The Little Red Creek Complex is not within the 2-mile-wide study corridors.

Coordination with the Casper Field Office provided pertinent information regarding the existing conditions of this unit. The Square Top Butte unit is accessible via Poison Spider Road on the south, Road 211 to the west, and Road 210 to the east. Casper Field Office range specialists indicated that several fences and wells exist in the area. Casper Field Office staff verified the existence of active pipeline rights-of-way in the Square Top Butte Unit:

- WYW 14288
- WYW 0200659
- WYC 41555

Field investigation resulted in verification of the presence of the pipeline rights-of-way. Using the boundaries identified by the Casper Field Office and field reconnaissance, the unit can be subdivided as follows:

- Subunit 1: 6,118 acres
- Subunit 2: 880 acres
- Subunit 3: 4,665 acres
- Subunit 4: 443 acres

The Square Top Butte unit has not undergone an official BLM inventory. An inventory (as per BLM Manual 6310) was scheduled for March 14, 2016 but was not completed due to inclement weather and inaccessibility. Initial inventory efforts indicate that Subunit 1 does meet size requirements and would require further review to determine the presence or absence of wilderness characteristics. However, it is important to note that Segment 1 is not crossed by centerline of the Proposed Action or by the alternative routes. Therefore, the inventory of the Segment 1 unit will not be conducted or included as part of this EIS.

3.2.11 Paleontological Resources

This section describes the paleontological resources found within the 2-mile-wide study corridors of the Project and alternative routes. Paleontological resources are any fossilized remains, traces, or imprints of organisms preserved in or on the Earth's crust that are of paleontological interest and provide information about the history of life on Earth. Fossils include bones, teeth, shells, leaves, wood, and trackways buried in sedimentary deposits. Paleontological resources do not include any materials associated with an archaeological resource or any cultural item (16 U.S.C. 470aaa-4).

3.2.11.1 Regulatory Framework

Paleontological resources occurring on federal and state lands are afforded protection by federal and state law and regulation. Protection for paleontological resources includes requirements for: (1) the assessment of areas containing paleontological resources that could be directly or indirectly affected, damaged, or destroyed by development prior to, and as a consequence of, authorization of ground-disturbing activities; and (2) the formulation and implementation of measures (e.g., permanent preservation of the discovered sites and/or permanent preservation of salvaged materials at federal- and state-approved institutions) to mitigate potentially adverse impacts. A significant paleontological resource is "any paleontological resource that is considered to be of scientific interest, including most vertebrate fossil remains and traces, and certain rare or unusual invertebrate and plant fossils" (BLM 2009a).

The primary regulations for paleontological resources include:

- FLPMA (43 U.S.C. 1701-1784) recognizes significant paleontological resources as scientific resources and requires federal agencies to manage public lands in a manner that protects the quality of scientific resources and, where appropriate, preserves and protects certain public in their natural conditions. NEPA (42 U.S.C. 4321) directs federal agencies to use all practicable means to "preserve important historic, cultural, and natural aspects of our natural heritage…."
- The Omnibus Public Land Management Act – Paleontological Resource Preservation codifies specific protection for paleontological resources that provide information about the history of life on earth; it contains criteria for the issuance of paleontological collection permits, directing the U.S. Secretaries of the Interior and Agriculture to ensure paleontological resources discovered on federal lands are curated properly into collections of approved repositories.
- The PRPA requires the Secretaries of the Interior and Agriculture to manage and protect paleontological resources on federal land using scientific principles and expertise (16 U.S.C. 470aaa et seq.). The PRPA includes specific provisions addressing management of these resources by the BLM, NPS, U.S. Bureau of Reclamation, USFWS, and the USFS.
- The BLM's policy for addressing potential impacts on paleontological resources on BLM-administered lands also applies, and is included in the following documents: (1) Paleontological Resource Management Handbook (H-8270), (2) General Procedural Guidance for Paleontological Resource Management (H-8270-1), (3) PFYC System for Paleontological Resources on Public Lands (WO IM 2016-124), and (4) Assessment and Mitigation of Potential Impacts to Paleontological Resources (WO IM 2014-124).
- The State of Wyoming enacted the Wyoming Antiquities Act in 1935 (Wyoming State Code 36-1-114 through 36-1-116), prohibiting:

  > …any excavation on any prehistoric ruins, pictographs, hieroglyphs or any other ancient markings, writing or archaeological and paleontological deposits on any state or federal public land in Wyoming without first obtaining a permit from the State Board of Land Commissioners.

3.2.11.2 Regional Setting

The Project would cross the Greater Green River Basin, the Beaver Divide, and the Wind River Basin. Both basins have a wide variety of Mesozoic and Cenozoic geological units that have been known to produce fossils in the past. The Greater Green River Basin was filled with Paleocene and Eocene fluvial and lacustrine sediments (Murphey and Daitch 2007). The Wind River Basin consists mostly of Eocene basin-fill sediments in the flat-lying, lower areas with belts of folded Precambrian, Paleozoic, and Mesozoic rocks forming the flanks and cores of the adjacent mountain ranges (Keefer 1970). The

escarpment called the Beaver Divide (Beaver Rim) is at the southern margin of the Wind River Basin and mostly includes a series of Tertiary sediments (Emry 1975).

3.2.11.3 Inventory Methodology

Information for the paleontological inventory was obtained from a review of the scientific literature and geologic maps, a record search from the Department of Geology and Geophysics at the University of Wyoming, a Paleontological Resource Assessment previously done for the Project (Erathem-Vanir Geological Consultants 2012), and a geology resource report (SCWA 2014b). Agencies contacted include the USGS, BLM, and WSGS.

Information about the geological units and known fossil localities were used to identify the paleontological potential in areas that would be affected by the Project. Paleontological potential levels were assigned to each geological unit using the PFYC adopted by the BLM for assessing paleontological potential on federal lands (WO IM 2016-124). The PFYC is a five-tiered system (1 to 5) classifying geological units based on relative abundance of vertebrate fossils or scientifically significant invertebrate fossils and plant fossils, and their potential to be adversely affected, with a higher class number indicating a higher potential. This classification is applied to a geological formation, member, or other distinguishable map unit, preferably at the most detailed level that can be mapped. It is not intended to be applied to specific paleontological localities or small areas within the units.

Although significant localities may occasionally occur in a geologic unit, a few widely scattered important fossils or localities do not necessarily indicate a higher class; instead the relative abundance of significant localities is intended to be the major determinant for the class assignment. Because of the direct relationship that exists between paleontological resources and the geological units they are found within, and by knowing the geology of an area and the fossils previously found in a geological unit, it is possible to predict where fossils likely would be found. The PFYC system is meant to provide baseline guidance for predicting, assessing, and mitigating paleontological resources. The classification should be considered at an intermediate point in the analysis, and should be used to assist in determining the need for further mitigation assessment actions (WO IM 2016-124). Each class is defined as follows:

Class 1 – **Very Low**. Geologic units that are not likely to contain recognizable fossil remains.

- Units that are igneous or metamorphic, excluding reworked volcanic ash units.
- Units that are Precambrian in age or older.

(1) Management concern for paleontological resources in Class 1 units is usually negligible or not applicable.
(2) Assessment or mitigation is usually unnecessary except in very rare or isolated circumstances.

The probability for impacting any fossils is negligible. Assessment or mitigation of paleontological resources is usually unnecessary. The occurrence of significant fossils is non-existent or extremely rare.

Class 2 – **Low**. Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils.

- Vertebrate or significant invertebrate or plant fossils not present or very rare.
- Units that are generally younger than 10,000 years before present.
- Recent aeolian deposits.
- Sediments that exhibit significant physical and chemical changes (i.e., diagenetic alteration).

(1) Management concern for paleontological resources is generally low.
(2) Assessment or mitigation is usually unnecessary except in rare or isolated circumstances.

The probability for impacting vertebrate fossils or scientifically significant invertebrate or plant fossils is low. Assessment or mitigation of paleontological resources is not likely to be necessary. Localities containing important resources may exist, but would be rare and would not influence the classification. These important localities would be managed on a case-by-case basis.

Class 3 – **Moderate** or **Unknown**. Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential.

- Often marine in origin with sporadic known occurrences of vertebrate fossils.
- Vertebrate fossils and scientifically significant invertebrate or plant fossils known to occur intermittently; predictability known to be low.

(or)

- Poorly studied and/or poorly documented. Potential yield cannot be assigned without ground reconnaissance.

Class 3a – **Moderate Potential.** Units are known to contain vertebrate fossils or scientifically significant nonvertebrate fossils, but these occurrences are widely scattered. Common invertebrate or plant fossils may be found in the area, and opportunities may exist for hobby collecting. The potential for a project to be sited on or impact a significant fossil locality is low, but is somewhat higher for common fossils.

Class 3b – **Unknown Potential.** Units exhibit geologic features and preservational conditions that suggest significant fossils could be present, but little information about the paleontological resources of the unit or the area is known. This may indicate the unit or area is poorly studied, and field surveys may uncover significant finds. The units in this Class may eventually be placed in another Class when sufficient survey and research is performed. The unknown potential of the units in this Class should be carefully considered when developing any mitigation or management actions.

(1) Management concern for paleontological resources is moderate; or cannot be determined from existing data.
(2) Surface-disturbing activities may require field assessment to determine appropriate course of action.

This classification includes a broad range of paleontological potential. It includes geologic units of unknown potential, as well as units of moderate or infrequent occurrence of significant fossils. Management considerations cover a broad range of options as well, and could include predisturbance surveys, monitoring, or avoidance. Surface-disturbing activities will require sufficient assessment to determine whether significant paleontological resources occur in the area of a Proposed Action, and whether the action could affect the paleontological resources. These units may contain areas that would be appropriate to designate as hobby collection areas due to the higher occurrence of common fossils and a lower concern about affecting significant paleontological resources.

Class 4 – **High**. Geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability. Surface disturbing activities may adversely affect paleontological resources in many cases.

Class 4a. Unit is exposed with little or no soil or vegetative cover. Outcrop areas are extensive with exposed bedrock areas often larger than two acres. Paleontological resources may be susceptible to adverse impacts from surface disturbing actions. Illegal collecting activities may impact some areas.

Class 4b. These are areas underlain by geologic units with high potential but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. The bedrock unit has high potential, but a protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts on the bedrock resulting from the activity.

- Extensive soil or vegetative cover; bedrock exposures are limited or not expected to be impacted.
- Areas of exposed outcrop are smaller than two contiguous acres.
- Outcrops form cliffs of sufficient height and slope so that impacts are minimized by topographic conditions.
- Other characteristics are present that lower the vulnerability of both known and unidentified paleontological resources.

(1) Management concern for paleontological resources in Class 4 is moderate to high, depending on the Proposed Action.
(2) A field survey by a qualified paleontologist is often needed to assess local conditions.
(3) Management prescriptions for resource preservation and conservation through controlled access or special management designation should be considered.
(4) Class 4 and Class 5 units may be combined as Class 5 for broad applications, such as planning efforts or preliminary assessments, when geologic mapping at an appropriate scale is not available. Resource assessment, mitigation, and other management considerations are similar at this level of analysis, and impacts and alternatives can be addressed at a level appropriate to the application.

The probability for impacting significant paleontological resources is moderate to high, and is dependent on the Proposed Action. Mitigation considerations must include assessment of the disturbance, such as removal or penetration of protective surface alluvium or soils, potential for future accelerated erosion, or increased ease of access resulting in greater looting potential. If impacts on significant fossils can be anticipated, on-the-ground surveys prior to authorizing the surface disturbing action will usually be necessary. Onsite monitoring or spot-checking may be necessary during construction activities.

Class 5 – Very High. Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils, and that are at risk of human-caused adverse impacts or natural degradation.

Class 5a. Unit is exposed with little or no soil or vegetative cover. Outcrop areas are extensive with exposed bedrock areas often larger than two contiguous acres. Paleontological resources are highly susceptible to adverse impacts from surface disturbing actions. Unit is frequently the focus of illegal collecting activities.

Class 5b. These are areas underlain by geologic units with very high potential but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. The bedrock unit has very high potential, but a protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts on the bedrock resulting from the activity.

- Extensive soil or vegetative cover; bedrock exposures are limited or not expected to be impacted.
- Areas of exposed outcrop are smaller than two contiguous acres.
- Outcrops form cliffs of sufficient height and slope so that impacts are minimized by topographic conditions.
- Other characteristics are present that lower the vulnerability of both known and unidentified paleontological resources.

(1) Management concern for paleontological resources in Class 5 areas is high to very high.
(2) A field survey by a qualified paleontologist is usually necessary prior to surface disturbing activities or land tenure adjustments. Mitigation will often be necessary before and/or during these actions.
(3) Official designation of areas of avoidance, special interest, and concern may be appropriate. The probability for impacting significant fossils is high. Vertebrate fossils or scientifically significant invertebrate fossils are known or can reasonably be expected to occur in the impacted area. On-the-ground surveys prior to authorizing any surface disturbing activities will usually be necessary. Onsite monitoring may be necessary during construction activities.

3.2.11.4 Potential Fossil-Bearing Geologic Formations

Potential fossil-bearing geologic formations occurring in the study area are described in this section.

3.2.11.4.1 Browns Park Formation (PFYC 3)

The Miocene Age Browns Park Formation overlies the Green River and Washakie Formations. It consists of gray, fine- to coarse-grained Tuffaceous sandstone and interbedded gray- to-white tuff, gray siltstone, and gray and red mudstone. Fossils are rare in the Browns Park Formation but some mammalian fossils have been located (Honey and Izett 1988, Murphey and Daitch 2007).

3.2.11.4.2 White River Formation or Group (PFYC 5)

In Wyoming, the White River Formation, which is Eocene to Oligocene in age, consists of three members: the lower Chadron Member, the intermediate Brule Member, and the informally designated upper conglomeratic member (Erathem-Vanir 2012). The lithostratographic package is treated as a formation in Colorado, Wyoming, and North Dakota but is accorded group status in Nebraska and South Dakota (Erathem-Vanir 2012). It is composed of volcaniclastic and siliciclastic sediments deposited in fluvial, lacustrine, and eolian environments (Zanazzi and Kohn 2008). The White River Group has produced a large mammalian fauna, including brontotheres, artiodactyls, carnivores, equids, bats, rhinoceratids, eomyids, oreodonts, rodents, and bats, as well as marsupials and reptiles (Kihm 1987, Zanazzi and Kohn 2008, Emry and Korth 2012, Erathem-Vanir 2012).

3.2.11.4.3 Wind River Formation (PFYC 5)

The Eocene Age Wind River Formation consists of variegated to drab claystone and siltstone with interbedded lenticular to sheetlike sandstone beds (Soister 1968). Fossils found in the Wind River Formation include tilodonts, taenidonts, cimolestids, arctocyonids, artiodactyls, rodents brontotheres, horse, and primates, as well as reptiles and plants (Robinson 1966, Williamson et al. 1996, Erathem-Vanir 2012).

3.2.11.4.4 Green River Formation (PFYC 5)

The Green River Formation is a large formation covering parts of northeastern Utah, northwestern Colorado, and southwestern Wyoming. The Green River Formation represents a series of Eocene lakes: Lake Uinta, Lake Gosiute, and Fossil Lake, formed of intermontane basins by uplift of the Rocky

Mountains (Grande 1984). The Green River Formation, in the Green River Basin of Wyoming, comprises the Luman Tongue, Scheggs Bed of Tipton Shale Member, Rife Bed of Tipton Shale Member, Wilkins Peak Member, LaClede Bed of Laney Member, and undivided Sand Butte and Hartt Cabin Beds of the Laney Member (Roehler 1992). Typical lithologies of the Green River Formation include soft to moderately resistant light-gray and buff marlstone, oil shale, limestone, siltstone, sandstone, conglomerate, and tuff. The accumulation of fossils occurs throughout its distribution although quality of preservation, abundance, and diversity varies both geographically and stratigraphically (Murphey and Daitch 2007).

3.2.11.4.5 Wasatch Formation (PFYC 5)

The Wasatch Formation was mostly deposited in a fluviatile environment and interfingers extensively with the lacustrine deposits of the Green River Formation in Utah, Colorado, and Wyoming (Murphey and Daitch 2007). The Wasatch Formation includes the Chappo and LaBarge members and the unnamed Main Body and is Paleocene to Eocene in age. It is composed of soft light-gray, red, green, white, yellow, and purple claystone, sandstone, siltstone, and conglomeratic sandstone (Rowley et al. 1985, Murphey and Daitch 2007). Throughout its distribution, the Wasatch Formation has produced scientifically significant fossils, although the preservation and abundance of fossils vary regionally and stratigraphically (Murphey and Daitch 2007). Fossils from the Wasatch Formation include condylarths, perrisodactyls, artiodactyls, pantodonts, insectivores, marsupials, reptiles, mollusks, and plants (Murphey and Daitch 2007, Erathem-Vanir 2012). A previous search for known fossil localities in the study area identified three localities in the Wasatch, Battle Spring, or Sundance Formations. These localities included fish teeth, mammalian tooth root, and a mammalian canine (Erathem-Vanir 2012).

3.2.11.4.6 Battle Spring Formation (PFYC 3)

The Battle Spring Formation consists of an arkosic sequence of friable conglomerate, conglomeratic sandstone, and sandstone that was deposited in a deltaic-fluviatile environment (Stephens 1964). The Battle Spring Formation intermingles with the Wasatch and Green River formations. Fragmentary plant fossils and fragmentary vertebrate fossils have been found in the Battle Spring Formation (Stephens 1964, Erathem-Vanir 2012).

3.2.11.4.7 Bridger Formation (PFYC 5)

The Middle Eocene Bridger Formation consists of three members: Black Forks Member, Twin Buttes Member, and Turtle Bluff member. Its depositional environment includes fluvial, lacustrine, playa lacustrine, paludal, marginal mudflat, basin margin, and volcanic deposits. The Bridger Formation comprises limestone, tuffs, and Tuffaceous sheet sandstones (Murphey and Daitch 2007). Numerous fossils have been found in the Bridger Formation, including plants, mollusks, fish, amphibians, reptiles, and mammals (Murphey and Daitch 2007, Murphey and Evanoff 2011).

3.2.11.4.8 Crooks Gap Conglomerate (PFYC 3)

The Eocene Crooks Gap Conglomerate consists mainly of granite boulders embedded in pink to gray arkosic sandstone and siltstone. The Crooks Gap Conglomerate may be equivalent to the Wind River Formation and lies with angular unconformity on the lower part of the Battle Spring Formation (Love 1970, Schmitt 1979).

3.2.11.4.9 Fort Union Formation (PFYC 3)

The Paleocene Fort Union Formation is mainly marine and consists of sandstone, shale, clay and coal. Several members have been recognized in the Fort Union Formation depending on the region. In Wyoming, the members of Fort Union that have been recognized are the Blue Gap Member, the China Butte member, the Kingsbury Conglomerate Member, the Kleenburn Member, the Lebo Member, the

Shotgun Member, the Tongue River Member, the Tullock member, and the Waltman Shale Member. Fossils found in the Fort Union Formation include plants, amphibians, reptiles, and mammals (Brown 1958, Sullivan 1982, Johnson 1986).

3.2.11.4.10 Mesaverde Formation or Group (PFYC 3)

The Mesaverde Group is a highly variable sequence of sandstone, siltstone, shale, carbonaceous shale, and coal (Keefer 1972). In southern Wyoming, along the Rawlins uplift, the Mesaverde Group includes the Almond Formation, the Pine Ridge Sandstone, the Allen Ridge Formation, and the Haystack Mountains Formation (Erathem-Vanir 2012). Fossils found in the Mesaverde Group include plants, nonmarine snails and bivalves, reptiles, fish, dinosaurs, and dinosaur tracksites (Keefer 1972, Murphey and Daitch 2007, Lockley et al. 2011). A previous search for known fossil localities in the study area revealed one locality in the Mesaverde Group that included shark teeth, a bird, turtle shell fragments, crocodile teeth, and dinosaur teeth (Erathem-Vanir 2012).

3.2.11.4.11 Lance Formation (PFYC 5)

The Lance Formation is composed of interbedded tan and gray sandstone and siltstone, gray shale, dark-gray and dark-brown carbonaceous shale, and coal. Freshwater and brackish-water mollusks, trace fossils, lizards, amphibians, a crocodile, birds, and a dinosaur have been found in the Lance Formation (Gilmore 1931, Estes 1969, Estes and Sanchiz 1982, Roehler 1993, Elzanowski et al. 2000, Falkingham et al. 2010).

3.2.11.4.12 Lewis Shale (PFYC 5)

The Lewis Shale consists of dark-gray shale and some thin interbedded ledge-forming tan or brown very fine to fine-grained sandstone and siltstone. At times the Lewis Shale interfingers with the overlying Fox Hills Sandstone. Fossils found in the Lewis Shale include trace fossils, mollusks, ammonites, and dinosaur (Roehler 1993, Lucas et al. 2005).

3.2.11.4.13 Cody Shale (PFYC 3)

The late Cretaceous Cody Shale consists of dark- to light-gray shale (marine) interlayered with thin gray to light-brown hard and soft sandstone and siltstone, and some calcareous concretionary beds that were laid down (Soister 1967, Finn 2014). There are 14 members recognized in the Cody shale that vary geographically (Erathem-Vanir 2012). Fossils found in the Cody Shale include mollusks, ammonites, shrimp, shark teeth, and fish (Cobban 1952, Merewether et al. 2010, Erathem-Vanir 2012).

3.2.11.4.14 Mowry and Thermopolis Shales (PFYC 3)

The Cretaceous Mowry Shale is a dark siliceous shale deposited in a restricted, oxygen-depleted sea referred to as the Mowry Sea. Fossil fish, shark, and rays have been found in the Mowry Shale (Reeside and Cobban 1960, Stewart and Hakel 2006, Erathem-Vanir 2012). The Thermopolis Shale consists of black shale, the basal member of which contains tan and rusty-weathering interbedded siltstones and sandstones. Fossils include plants, bacculites, and foraminifera and crocodile, fish, and bivalves (Eicher 1960, Erathem-Vanir 2012).

3.2.11.4.15 Cloverly, Morrison, and Sundance Formations (PFYC 5)

The Cloverly Formation consists of conglomerate, chert, and mudstone. Fossils found in the Cloverly Formation include dinosaurs, turtles, lizards, and fish (Erathem-Vanir 2012). The Jurassic Morrison Formation consists of fluvial and lacustrine deposits characterized by thick layers of multicolored mudstone in the Rocky Mountain Region. Facies changes are found throughout the initial sequence of the formation due to discontinuous sediments of heterolithic sandstone, siltstone, and mudstone (Ikejiri et al.

2006). Fossils found in the Morrison include dinosaurs, fish, amphibians, reptiles, trackways, and plants (Foster 2003, Ikejiri et al. 2006). The Sundance Formation consists of an alternating sequence of greenish-gray shale, light-gray to yellowish-brown sandstone and siltstone, and gray limestone. A previous search for known fossil localities in the study area revealed one locality in the Sundance Formation that produced fragmentary ichthyosaur post cranial bones (Erathem-Vanir 2012)

3.2.11.4.16 Frontier Formation (PFYC 3)

The late Cretaceous Frontier Formation is composed of shale, siltstone, sandstone, conglomerate, and bentonite deposited in marine and nonmarine environments (Dutton 1993, Merewether et al. 2010). Fossils found in the Frontier Formation include plants, ammonites, mollusks, and bivalves (Knowlton 1917, Merewether and Cobban 2007, and Merewether et al. 2010).

3.2.11.4.17 Chugwater and Dinwoody Formations (PFYC 3)

The Triassic Chugwater Formation consists of interbedded red shales and siltstones and overlies the Dinwoody Formation. The Dinwoody Formation consists of brown, yellow, and green shales and interbedded gypsiferous siltstone, dolomite, and limestone (Bullock and Wilson 1969). Fossils found in the Chugwater Formation include plants, amphibians, and dinosaur tracks (Berry 1924, Katz 1976, Lovelace and Lovelace 2012). The Dinwoody Formation consists of brown, thin-bedded, marine siltstone (Santucci and Wall 1998). Fossils fond in the Dinwoody Formation include brachiopods and conodonts (Santucci and Wall 1998, Rodland and Bottjer 2001).

3.2.11.4.18 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Segment 1 crosses 9 geologic units, 5 of which have very high potential (PFYC 5) to produce paleontological resources. These are the Laney Shale Member of the Green River Formation (Tgl), New York Tongue of the Wasatch Formation and Fontenelle Tongue of the Green River (Twg), Green River and Wasatch Formations (Tgrw), the La Barge and Chappo Members of the Wasatch Formation (Twlc), and the Wasatch Formation (Twd). The Proposed Action and Alternatives 1B: Dry Piney and 1C: Figure Four cross the same five geological units with PFYC 5. The geologic units and their PFYC are shown in Table 3-77.

Several members of the Green River and Wasatch formation are present in Segment 1. Both formations have a long history of producing scientifically significant fossils (Cope 1884, Mook 1959, Lundberg and Case 1978, West and Dawson 1975, Langston and Rose 1978, Savage and Waters 1978, Gingerich and Dorr 1979, Dorr and Gingerich 1980, Grande 1984, Honey et al. 1988, Gunnell 1994, Gunnell and Bartels 1994, Ferber and Wells 1995, Gardner 1999, Zonneveld et al. 2000, Foster 2001, McGee 2002, Murphey and Daitch 2007. A previous paleontological resource assessment found fossil turtle and crocodile remains along this segment (Erathem-Vanir 2012).

Table 3-77
Geological Units and Associated Potential Fossil Yield Classification in the Study Area

Age	Geologic Unit	Symbol	PFYC
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant			
Pleistocene/Holocene	Alluvium and Colluvium	Qa	1 to 2
Pleistocene/Holocene	Gravel, Pediment, and Fan Deposits	Qt	1 to 2
Eocene	Laney Shale Member of Green River Formation	Tgl	5
Eocene	New York Tongue of the Wasatch Formation and Fontenelle Tongue of the Green River	Twg	5
Eocene	Green River and Wasatch Formations	Tgrw	5
Eocene	La Barge and Chappo Members of the Wasatch Formation	Twlc	5

Table 3-77
Geological Units and Associated Potential Fossil Yield Classification in the Study Area

Age	Geologic Unit	Symbol	PFYC
Eocene	Diamictite and Sandstone of Wasatch Formation	Twd	5
Devonian-Mississippian	Darby Formation	MD	2
Cambrian-Ordovician	Middle Cambrian-Upper Ordovician Limestone and Dolomite	O_	2
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect			
Pleistocene/Holocene	Alluvium and Colluvium	Qa	1 to 2
Pleistocene/Holocene	Dune Sand and Loess	Qs	1 to 2
Pleistocene/Holocene	Playa Lake and Other Lacustrine Deposits	Ql	1 to 2
Pleistocene/Holocene	Alkalic Volcanic Rock	Qi	1
Pleistocene/Holocene	Gravel, Pediment and Fan Deposits	Qt	1
Miocene	Browns Park Formation/Miocene Rocks	Tm	3
Oligocene	White River Group	Twr	5
Eocene	Laney Shale Member of Green River Formation	Tgl	5
Eocene	Fontenelle Tongue of Green River Formation	Twg	5
Eocene	Tipton Shale Member or Tongue of Green River Formation	Tgt	5
Eocene	Wilkins Peak Member of Green River Formation	Tgw	5
Eocene	Wilkins Peak Member and Tipton Shale Member or Tongue of Green River Formation	Tgwt	5
Eocene	Cathedral Bluffs Tongue of Wasatch Formation	Twc	5
Eocene	Bridger Formation	Tb	5
Eocene	Crooks Gap Conglomerate	Tcg	3
Eocene	Transition Between Battle Spring Formation and Wasatch Formation	Tbw	3
Paleocene/Eocene	Battle Spring Formation	Tbs	3
Paleocene/Eocene	Main Body of Wasatch Formation	Twm	5
Paleocene	Fort Union Formation	Tfu	3
Cretaceous	Almond Formation of Mesaverde Group	Kal	3
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect			
Pleistocene/Holocene	Alluvium and Colluvium	Qa	1 to 2
Pleistocene/Holocene	Dune Sand and Loess	Qs	1 to 2
Miocene	Miocene Rocks	Tm	3
Oligocene	White River Formation	Twr	5
Eocene	Wind River Formation	Twdr	5
Paleocene/Eocene	Battle Spring Formation	Tbs	3
Paleocene	Fort Union Formation	Tfu	3
Cretaceous	Lance Formation	Kl	5
Cretaceous	Lance Formation, Fox Hills Sandstone, Meeteetse Formation, Bearpaw and Lewis Shales	Klm	5
Cretaceous	Frontier Formation	Kf	3
Cretaceous	Meeteetse Formation and Lewis Shale	Kml	3
Cretaceous	Mesaverde Formation or Group	Kmv	3
Cretaceous	Cody Shale	Kc	3
Cretaceous	Mowry and Thermopolis Shales	Kmt	3
Jurassic/Cretaceous	Cloverly, Morrison, and Sundance Formations	KJs	5
Triassic	Chugwater and Dinwoody Formations	@cd	3
Proterozoic	Granitic Rocks	Wg	1
Proterozoic	Metasedimentary and Metavolcanic Rocks	WVsv	1

3.2.11.4.19 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Segment 2 crosses 23 geologic units, 18 of which have moderate to very high potential to produce paleontological resources. These include the Almond Formation and Mesaverde Group (Kal), Fox Hills Formation (Kfl), Landslide Creek Formation (Kl), Lewis Shale (Kle), Bridger Formation (Tb), Battle Springs Formation (Tbs), Transition between Battle Springs Formation and Wasatch Formation (Tbw), Crooks Gap Conglomerate (Tcg), Fort Union Formation (Tfu), Green River Formation (Tgl, Tgt, Tgw, and Tgwt), New York Tongue of the Wasatch Formation and Fontenelle Tongue of the Green River (Twg), Browns Park Formation (Tm), Wasatch Formation (Twc, Twm), and White River Group (Twr). A previous paleontological resource assessment found fossil crocodile and gar remains along this segment (Erathem-Vanir 2012). In addition, an old GLO map shows and area labeled as having "petrified forest with fossil reptilian remains" that would be crossed by the Project southeast of Highway 28.

3.2.11.4.20 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Segment 3 crosses 25 geologic units, 19 of which have moderate to very high potential to produce paleontological resources. These include the Chugwater Group (@cd), Cody Shale (Kc), Frontier Formation (Kf), Sundance Formation (KJs), Landslide Creek Formation (Kl), Lance Formation/Fox Hills Sandstone/Meeteetse Formation/ Bearpaw and Lewis Shales (Klm), Meeteetse Formation (Kml), Mowry Shale and Thermopolis Shale (Kmt), Mesaverde Group (Kmv), Cloverly Formation (MzPz), Minnekahta Limestone (PM), Battle Spring Formation (Tbs), Crooks Gap Conglomerate (Tcg), Fort Union Formation (Tfu), Browns Park Formation (Tm), Wagon Bed Formation (Twwb), Wind River Formation (Twdr), and White River Group (Twr). A previous paleontological resource assessment found fossil turtle and petrified wood along this segment, south of Highway 26 (Erathem-Vanir 2012).

3.2.12 Public Health and Safety

The Public Health and Safety section responds to issues raised by the public, tribes, and agencies during Project scoping and preparation of the EIS related to potential effects on public health and safety, including hazardous materials and spill prevention.

3.2.12.1 Hazardous Materials Regulatory Framework

In addition to the federal, state, and local permit requirements identified in Section 1.6 of this document, the federal and state laws that govern hazardous materials and waste are listed herein. Applicable laws and regulations address the use and storage of hazardous materials and the generation, storage, transportation and disposal of hazardous and solid waste to protect the environment from contamination. These laws are also intended to protect facility workers and the surrounding community from exposure to hazardous materials. The presence of hazardous materials at a site can affect the applicable requirements of programs not directly addressing hazardous materials (i.e., stormwater permitting and dry well management).

3.2.12.1.1 Federal

- OSHA Hazardous Communication– 29 CFR 1910.1200 This Standard establishes uniform requirements to ensure that the hazards of all chemicals imported into, produced or used in U.S. workplaces are evaluated, and that the resultant hazard information and associated protective measured are transmitted to affected employers and potentially exposed employees.
- Solid Waste Disposal Act (40 CFR 279) – Requires generators of used oil to prevent spills and correctly label, store, transport and dispose/recycle used oil.

- Emergency Planning and Community Right-to-Know Act – 40 CFR 370 establishes requirements for federal, state and local governments, and industry regarding emergency planning and "Community Right-to-Know" reporting on hazardous and toxic chemicals. The law established a nationwide emergency planning and response program and imposed reporting requirements for businesses that store, handle, or produce significant quantities of hazardous materials.
    - Section 304 – This section requires immediate notification to the State Emergency Response Commission when a hazardous material is released in excess of its reportable quantity, which is specific to given categories of chemicals. If a CERCLIS Act-listed hazardous substance reportable quantity is released, notification must also be given to the National Response Center in Washington, D.C. (Reportable quantities are listed in 40 CFR Part 302, Table 302.4). These notifications are in addition to notifications given to the local emergency response team or fire personnel;
    - Section 311 – This section requires that either material safety data sheets for all hazardous materials or a list of all hazardous materials be submitted to the State Emergency Response Commission, the Local Emergency Planning Commission and local fire department;
    - Section 312 – This section requires owners or operators of a facility such as the Riley Ridge Sweetening Facility to submit an emergency and hazardous chemical inventory to the State Emergency Response Commission, the LEPCs, and the local fire departments with jurisdiction over the facility. A Tier II report that must be filed by March 1st of each year. Hazardous chemicals covered by Section 312 are those for which facilities are required to prepare or have available material safety data sheets under OSHA regulations, and that were present at the facility at any time during a given calendar year above specified thresholds. Federal rules require reporting these hazardous chemicals if the inventory exceeds 10,000 pounds at any one time, and for extremely hazardous chemicals when the inventory exceeds 500 pounds or the threshold planning quantity.
    - Section 313 – This section applies to a facility that has 10 or more employees; is in an EPCRA-listed Standard Industrial Category code, which manufactures, processes or otherwise uses any of the EPCRA Section 313 chemicals; and that exceeds the usage thresholds for a chemical or chemical category.
- Hazardous Materials Transportation Act– 49 CFR Parts 171-179 regulates transportation of hazardous materials, and is implemented by the USDOT. Analogous requirements are promulgated for hazardous waste under 40 CFR Part 263 by the EPA. The act requires chemical manufacturers and hazardous waste generators and transporters to follow certain preparation, packaging, handling, loading/off-loading, routing, emergency planning, notification, and insurance requirements.
- RCRA 40 CFR 260, 261, 263 – RCRA provides authority to the EPA to regulate all aspects of hazardous waste management, including generation, transportation, storage, and disposal.
- 40 CFR 273 Universal waste rules were promulgated by the EPA to regulate the handling of certain specific categories of waste materials designated as "universal." These include batteries, pesticides and thermostats (which can contain mercury). Most industrial and commercial facilities routinely generate some quantity of universal wastes, and this is likely the case for the Riley Ridge Sweetening Facility.
- Oil Management is regulated under Section 311 of the CWA and Title 40 of the CFR, Part 112 (40 CFR 112). These provide guidance for the regulation of oil storage and management in the U.S. Facilities with above-ground oil storage capacity greater than 1,320 gallons (excluding containers that are less than 55 gallons in capacity) must prepare and implement an SPCC Plan.

3.2.12.1.2 State

- Wyoming Environmental Quality Act, W.S. 35-11-101 et seq.
- The authority for the rules and regulations promulgated in this chapter is the Wyoming Environmental Quality Act, W.S. 35-11-101 et seq. Specific sections of the act that provide authority for this regulation include W.S. 35-11-102, 35-11-109, and Article 5, Solid Waste Management, 35-11-501 et seq.

In addition, as part of the POD developed for this Project, the Hazardous Materials Management and Spill Prevention, Control, and Countermeasure Plan (Appendix A) outlines measures that will be taken to comply with federal, state and local regulations during construction operation and maintenance activities associated with the Proposed Action.

3.2.12.2 Pipeline Reliability and Safety Regulatory Framework

In addition to permit requirements identified in Section 1.6, there are several federal and State of Wyoming safety regulations with which the Project must comply. Descriptions of these regulations are provided below.

3.2.12.2.1 Federal

Federal agencies with jurisdictional authority and regulatory compliance responsibility regarding the Project include:

- PHMSA
- OPS
- USDOT

The federal safety legislation applicable to the Project includes:

- Hazardous Liquid Pipeline Act of 1979 as amended (49 U.S.C. 60101);
- 49 CFR Parts 190-195;
  - Part 190: Pipeline Safety Program and Rulemaking Procedures
  - Part 191: Transportation of Natural and Other Gas by Pipeline
  - Part 192: Transportation of Natural and Other Gas by Pipeline, Minimum Federal Safety Standard
  - Part 195: Transportation of Hazardous Liquids by Pipeline
- Pipeline Safety Improvement Act of 2002;
- Pipeline Inspection Protection, Enforcement, and Safety Act of 2006; and
- Pipeline Transportation Safety Improvement Act of 2011.

Part 192 prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Under Section 192.615, each pipeline operator must also establish an emergency plan that provides written procedures to minimize the hazards from a pipeline emergency. Key elements of the plan include procedures for:

- Receiving, identifying, and classifying emergency events - gas leakage, fires, explosions, and natural disasters
- Establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response
- Making personnel, equipment, tools, and materials available at the scene of an emergency
- Protecting people first and then property, and making them safe from actual or potential hazards
- Emergency shutdown of system and safe restoration of service

Each operator must establish and maintain liaison with appropriate fire, police, and public officials to communicate the resources and responsibilities of each organization that may respond to a gas pipeline emergency, and coordinate mutual assistance in responding to emergencies. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials.

The PHMSA administers the national regulatory program to promote the safe transportation of natural gas and other hazardous materials by pipeline in addition to regulations relating to pipeline safety under Title 49, U.S. Code Chapter 60101. PHMSA provides safety regulations and promotes risk management for safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards which set the level of safety to be attained and allow the pipeline operator to use various technologies and BMPs to achieve safety. PHMSA works to minimize the risks to people and the environment from pipeline incidents. This work is shared with state agency partners and others at the federal, state, and local levels.

3.2.12.2.2 State

The state agencies with administrative authority for pipeline reliability and safety include:

- WPA
- WOGCC
- WYDOT

The applicable Wyoming legislation includes Title 37 – Public Utilities

The Wyoming Public Service Commission administers Title 37 regarding pipeline construction, maintenance, and general safety provisions in the state of Wyoming. Wyoming State Statute 37-1-103(a) empowers the Public Service Commission with certain entitlements regarding public utilities, which include oil and natural gas pipelines. A public utility (as defined in W.S. 37-1-101(vi)(G) and Public Service Commission Rules and Regulations, Chapter 2, Section 202(b)(c)) includes every person that owns, operates, leases, controls or has power to operate, lease or control any plant, property or equipment for the transportation or conveyance to or for the public of oil or gas by pipeline, or any plant, property, or equipment, used for the purpose of transporting, selling or furnishing natural gas to any consumer or consumers in the state of Wyoming for industrial, commercial or residential use. Wyoming State agencies act as the USDOT's agent to inspect interstate facilities within its boundaries; however, the USDOT is responsible for enforcement action.

3.2.12.3 Hazardous Materials and Waste

By definition, hazardous materials (substances and wastes) have the potential to pose a significant threat to human health and the environment based on quantity, concentration, or chemical composition. Existing information from the EPA EnviroFacts database and GIS analysis of the proposed alternative pipeline routes was used to identify hazardous waste sites and sites with a history of environmental contamination that are present in the study area. This database search was comprehensive and included sites that did not necessarily contain contaminated soil or groundwater but were identified in federal or state databases for compliance with or enforcement of environmental regulations. For example, the list includes sites that are regulated by the EPA because they either generate, store, transport, or dispose of hazardous waste; are recyclers; or contain underground or above-ground storage tanks. The list also includes sites that require no further action.

Assumptions made regarding the affected environment for Public Health and Safety are based on the locations of Project facilities, rights-of-way, extra workspaces, and staging areas and descriptions of

construction, operation, and maintenance techniques used for the Project described in Chapter 2 of this EIS.

3.2.12.3.1 Characteristics of Carbon Dioxide

The transportation of liquefied CO_2 by pipeline involves some degree of risk in the event of an accident and subsequent release of CO_2 as a gas. At ambient temperatures CO_2 is a colorless and tasteless gas that is a natural component of air. At concentrations between 2 to 10 percent, CO_2 can cause nausea, dizziness, headaches, confusion, increased blood pressure and respiratory rate. At concentrations above 10 percent, CO_2 has a noticeably sharp odor, and can produce labored breathing, headache, visual impairment, and ringing in the ears. At increasing concentrations, CO_2 will cause impairment of judgment, loss of consciousness and asphyxiation.

Carbon dioxide has a low toxicity and is not flammable or explosive and will, in fact, extinguish fire by depriving flames of oxygen. At ambient temperatures and pressures CO_2 has a specific gravity greater than 1.5 kg/m^3 and will generally disperse in air. The phase attributes are important because it is most efficient to transport CO_2 in its dense liquid phase or its non-gaseous state because pipeline flow capacity of the liquid phase is twice that of the gaseous phase. A non-gaseous fluid acts as a gas but has the density of a fluid. Impurities (CH_4, H_2S, and nitrogen) in the CO_2 can modify the phase behavior and affect the ability to transport CO_2 efficiently (Jung and Nicot 2010). CH_4 is not an asphyxiant, but can be harmful at high concentrations and is categorized as Immediately Dangerous to Life and Health by the Center for Disease Control and Prevention (CDC) for exposure of concentrations of 40,000 ppm in less than 1 minute (CDC, n.d.). Acutely, it is mildly irritating to eyes, skin, and lungs. However, contact with rapidly expanding gas (from a tank or pipeline rupture) can cause cryogenic burns to lungs if inhaled and frostbite to exposed skin. Chronic exposure can harm the lungs.

Overall, pipelines are a relatively safe mode of transportation for hazardous liquids. Since the Pipeline Inspection Protection, Enforcement, and Safety Act was enacted in 2006, an average of 40 serious pipeline incidents (involving a fatality or injury requiring in-patient hospitalization have occurred) annually (USDOT PHMSA 2014). Due to fewer miles of CO_2 pipelines in the U.S. compared to natural gas or other hazardous liquids pipelines, their placement in remotes areas, and the compounds non-flammable characteristics, CO_2 transmission pipelines have a very safe record with few incidents. This does not mean CO_2 does not have risk associated with its use or transport for EOR purposes.

Per the USDOT PHMSA (2009, 2014), there are approximately 3,600 miles of CO_2 pipelines operating in the U.S. compared to 500,000 miles of natural gas and other hazardous liquids pipelines. Based on recent accident reports published by PHMSA, CO_2 transmission pipelines have an excellent safety record and a low incident rate when compared to other hazardous liquids pipelines (USDOT PHMSA 2014). Industry-wide safety regulations have been established to minimize incidents during construction and operation of CO_2 pipelines.

During the 20-year period from 1994 through 2013, PHMSA recorded a total of 2,633 significant incidents (involving a fatality or in-patient hospitalization, $50,00 or more total cost, release of highly volatile liquid, or liquid release resulting in fire or explosion) related to onshore hazardous liquids pipelines nationwide, of which CO_2 pipelines comprise a very small fraction (significant incidents involving CO_2 pipelines comprise 0.9 percent of all significant incidents involving pipelines during this period). The pipelines included in the dataset vary widely by age, diameter, and corrosion control measures. Table 3-78 provides a distribution of the causal factors as well as the number of each incident by cause. The dominant causes of pipeline incidents are corrosion and pipeline material, weld or equipment failure constituting 51.8 percent of all significant incidents.

Table 3-78
Hazardous Liquid Pipeline Significant Incidents by Cause (1994 to 2013)

Cause	Number of Incidents	Percentage
Pipeline material, weld, or equipment failure	721	27.4
Corrosion	642	24.4
Excavation[1]	435	16.5
Natural force damage	125	4.7
Outside force[2]	51	1.9
Incorrect operation	228	8.7
All other causes[3]	431	16.4
Total	2,633	100

SOURCE: USDOT PHMSA 2014
NOTES:
Table includes onshore hazardous liquids pipeline incidents only; offshore incidents were excluded. All data was gathered from PHMSA significant incident files, May 7, 2014. http://primis.phmsa.dot.gov/comm/reports/safety/.
[1]Includes third party damage.
[2]Fire, explosion, vehicle damage, previous damage, intentional damage.
[3]Miscellaneous causes or unknown causes.

Of those significant incidents documented from 1994 through 2013 for hazardous liquids pipelines, 24 occurred on CO_2 pipelines. Of those, 16 were the result of pipeline material, weld, or equipment failure; 2 were the result of corrosion; 1 incident resulted from outside force; and 3 incidents resulted from other causes. No deaths or injuries resulted from significant incidents on CO_2 pipelines (USDOT PHMSA 2014).

3.2.12.3.2 Characteristics of Hydrogen Sulfide

Hydrogen sulfide occurs naturally and is also produced by human activities. Hydrogen sulfide is a flammable, colorless gas that smells like rotten eggs. People usually can smell H_2S at low concentrations in air ranging from 3 to 5 ppm. Hydrogen sulfide occurs naturally in crude petroleum, natural gas, volcanic gases, and hot springs. It is used primarily in the production of sulfur and sulfuric acid (OSHA 2005).

Studies in humans suggest that the respiratory tract and nervous system are the most sensitive targets of H_2S toxicity. Exposure to low concentrations of H_2S may cause irritation to the eyes, nose, or throat. It may also cause difficulty in breathing for some asthmatics. Respiratory distress or arrest has been observed in people exposed to very high concentrations of H_2S. Exposure to low concentrations of H_2S may cause headaches, poor memory, tiredness, and balance problems. Brief exposures to high concentrations of H_2S can cause loss of consciousness. In most cases, the person appears to regain consciousness without any other effects. However, in some individuals, there may be permanent or long-term effects such as headaches, poor attention span, poor memory, and poor motor function (OSHA 2005).

It is important to note, as described in Chapter 2, the gas from the existing Riley Ridge Treating Plant is a mixture of H_2S and CO_2 which would be converted from a gaseous state at extraction to a non-gaseous state (fluid or non-gaseous state) for transport to the Riley Ridge Sweetening Plant. This facility would be constructed and operated to separate the CO_2 from the H_2S, and the H_2S would be injected into a deep geologic formation via two onsite injection wells.

3.2.12.3.3 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Table 3-79 lists two reports of sites with a history of hazardous materials release that occurred in Segment 1 of the study area

Table 3-79 Hazardous Material Occurrences in Segment 1		
Facility Name	**Address**	**EPA Program**
Big Piney Compressor Station	NE 1/4 SEC 20 T28N R113W Big Piney, WY 83113	RCRA (2004) (Nitrogen dioxide)
Air Products & Chemicals Inc. APMTG Facility	1 Helium Lane Big Piney, WY 83113-1109	Toxic Release Inventory (2006) (Helium)
SOURCE: EPA 2015d		

No other Wyoming sites with previous contamination would be crossed by the proposed alternative pipeline route and the Project would not cross any municipal solid waste or hazardous waste landfills in Wyoming in Segment 1.

There are no known occurrences of hazardous materials or contaminated sites along the Segment 1 alternative pipeline routes or near the proposed location for the Riley Ridge Sweetening Plant.

3.2.12.3.3.1 Fire Hazard

The Project pipelines would cross a mixture of sagebrush, scrub, riparian, woodland, and rural environments, each of which has an associated fire risk. The Wyoming Multi Hazard Risk Assessment database indicates that Sublette County is considered to be at high risk of fire due to the types of vegetation and landscape present in the study area (Federal Emergency Management Agency [FEMA] 2015).

3.2.12.3.3.2 Emergency Response

A network of fire departments and districts provides fire protection and suppression services across the region. Many of the fire districts across the region are staffed by volunteers and are housed in stations located in the larger communities. The closest existing emergency services and facilities in the Segment 1 study area, which includes the Green River crossing, would be provided by the Pinedale, Big Piney or Sublette County Sheriff and Fire Departments, depending on location.

For each county along the proposed alternative pipeline routes, there is at least one acute care facility either in the county crossed or within approximately 50 miles of the proposed alternative pipeline routes in a neighboring county. These facilities provide emergency medical care and in several cases, also serve as the base for local emergency medical response and transport services. The closest emergency medical services would be provided by Pinedale Medical Clinic and Sublette County Ambulance (Big Piney, Wyoming). Specific contact information for emergency services is presented in the Appendix M of the POD (Appendix A), developed for the Proposed Action.

3.2.12.3.4 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Table 3-80 lists sites with a history of hazardous materials release identified in the study area for Segment 2:

Table 3-80 Hazardous Material Occurrences in Segment 2		
Facility Name	**Address**	**EPA Program**
Jonah Inventory Yard	40 Windmill Road Boulder, WY 82923	RCRA (2013)
FARSON-LANDER (WYO 28) SCP-TC-P141021	Unknown (Latitude 42.212903/ Longitude -109.20861)	National Pollutant Discharge Elimination System (NPDES) (2009)
SOURCE: EPA 2015d		

No other Wyoming sites with previous contamination are crossed by the proposed alternative pipeline routes and the Project would not cross any municipal solid waste or hazardous waste landfills in Wyoming in Segment 2.

3.2.12.3.4.1 Fire Hazard

The Project pipeline alternative routes cross a mixture of sagebrush, scrub, riparian, woodland, and rural environments, each of which has an associated fire risk. The Wyoming Multi Hazard Risk Assessment database indicates that Sweetwater County is considered to be at high risk of fire due to the types of vegetation and landscape present in the of the study area.

3.2.12.3.4.2 Emergency Services

A network of fire departments and districts provides fire protection and suppression services across the region. Many of the fire districts across the region are staffed by volunteers and are housed in stations located in the larger communities. The closest existing emergency services and facilities in Segment 2 would be provided by Rock Springs or Sweetwater County Sherriff and Fire Departments depending on location of the situation. For each county along the proposed alternative pipeline routes, there is at least one acute care facility either in the county crossed or within approximately 50 miles of the proposed alternative pipeline routes in a neighboring county. These facilities provide emergency medical care and in several cases, also serve as the base for local emergency medical response and transport services. The closest emergency medical services are available at Memorial Hospital of Sweetwater County, which is in Rock Springs.

Specific contact information for emergency services is presented in Appendix M of the POD (Appendix A), developed for the Proposed Action.

3.2.12.3.5 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Table 3-81 lists sites with a history of hazardous materials release that have been identified in the study area for Segment 3.

Table 3-81
Hazardous Material Occurrences in Segment 3

Facility Name	Address	EPA Program
Happy Springs Unit/Richardson Operating Company	S4 T28N R93W, Fremont County	Integrated Compliance Information System NPDES (2008)
Jeffrey City Schools	375 Bob Adams Jeffrey City, WY 82310	RCRA (2008)
Clark Ranch Field	Latitude: 43.03566 Longitude: 106.958295, Natrona County	Integrated Compliance Information System NPDES (2009)

SOURCE: EPA 2015d

No other Wyoming sites with previous contamination are crossed by the proposed alternative pipeline routes and the Project would not cross any municipal solid waste or hazardous waste landfills in Wyoming in Segment 3.

3.2.12.3.5.1 Fire Management

The Project pipelines alternative routes cross a mixture of sagebrush, scrub, riparian, woodland, and rural environments, each of which has an associated fire risk. The Wyoming Multi Hazard Risk Assessment

database indicates that Fremont County, and Natrona County are considered to be at high risk of fire due to the types of vegetation and landscape present in the study area.

3.2.12.3.5.2 Emergency Management

The existing emergency services in Segment 3 would be provided by Freemont and Natrona Counties as well as Casper or Lander sheriff and Fire Departments depending on location of the situation.

A network of fire departments and districts provides fire protection and suppression services across the region. Many of the fire districts across the region are staffed by volunteers and are housed in stations located in the larger communities. For each county along the proposed alternative pipeline routes there is at least one acute care facility either in the county crossed or within approximately 50 miles of the proposed alternative pipeline routes in a neighboring county. These facilities provide emergency medical care and in several cases, also serve as the base for local emergency medical response and transport services.

Emergency medical services are available at Lander Regional Hospital, Arapahoe Health Center (Arapahoe, Wyoming), and the Rendezvous Medical Center (Riverton, Wyoming). Specific contact information for emergency services is presented in Appendix M of the POD (Appendix A).

3.2.13 Recreation

3.2.13.1 Regulatory Framework

BLM-administered lands in the Project area are managed by direction provided in the respective RMPs that establishes the goals and objectives for the management of recreation resources. The approved management plans and their amendments relevant to the study area are listed in Section 1.6.2, Relationship to Policies, Programs and Plans. A resource report prepared by the Applicant (SWCA 2014c) was used as the basis for this inventory, and updated and supplemented with BLM and secondary source GIS spatial data and aerial photo interpretation.

The Wyoming State Parks, Historic Sites, and Trails, Wyoming Statewide Comprehensive Outdoor Recreation Plan (2009 to 2013) (Wyoming Division of State Parks Historic Sites and Trails 2009) directs the development of recreation and parks resources. This plan is used by local, state, and federal agencies as a guide for development and provision of future outdoor recreation development. The purpose for the 5-year plan is to identify the outdoor recreation needs of citizens and visitors to Wyoming and to develop a program to address those needs.

3.2.13.2 Regional Setting

Recreational opportunities in the Project study corridors include hunting and fishing; hiking and mountain biking; horse packing and riding; wildlife viewing and photography and OHV.

3.2.13.3 Recreation Areas

Recreation sites, access, and parks include areas such as campgrounds and hiking areas that have been designated as such for public and private use. BLM defines dispersed recreation as “recreation activities of an unstructured type, which are not confined to specific locations such as recreation sites. Example[s] of these activities may be hunting, fishing, off-road vehicle use, hiking, and sightseeing” (BLM 2008c). Dispersed recreation occurs in the study corridors, mainly in areas with trails that enable user access to specific areas and allow for recreation activities such as camping, backpacking, or OHV use. Some designated recreation sites may require a fee or permit.

Areas where big game and migratory birds tend to gather may allow for hunting activities as well as wildlife viewing opportunities in a natural setting. Big game hunting is one of the larger dispersed recreation activities that occur in the study corridors, with opportunities for hunting elk, mule deer, and pronghorn antelope being some of the most popular.

Dispersed recreation activities that could occur on BLM-administered lands in the study corridors are displayed in Table 3-82.

Table 3-82
Dispersed Recreation Activities in the 2-Mile-Wide Study Corridors

Bureau of Land Management Field Office	Dispersed Recreation Activities													
	Backpacking	Biking	Boating	Camping	Driving for Pleasure	Fishing	Geocaching	Hiking	Horse-Back Riding	Hunting	Off-Highway Vehicle Use	Photography	Wildlife Viewing	Other
Casper Field Office	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Lander Field Office	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pinedale Field Office	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rawlins Field Office	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Rock Springs Field Office	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

3.2.13.3.1.1 Special Recreation Management Areas

SRMAs are designated to manage intensively used recreation areas and provide certain recreation opportunities, such as boating, hunting, camping, and hiking. Per the BLM, SRMAs are "…administrative units where the existing or proposed recreation opportunities and recreation setting characteristics are recognized for their unique value, importance, and/or distinctiveness, especially as compared to other areas used for recreation" (BLM 2012e).

3.2.13.3.1.2 Extensive Recreation Management Areas

ERMAs emphasize the traditional dispersed recreation use of public lands (BLM 2011a). ERMAs have an undeveloped character that allows visitors to escape crowds, rely on their own skills and equipment for recreation pursuits, and freedom from stricter regulations (BLM 2011a).

3.2.13.4 Trails

The BLM and counties have both motorized and non-motorized trails in the 2-mile-wide study corridors. Recreational use of motorized trails allows for ATVs and four-wheel drive vehicles. Non-motorized trails also occur throughout the 2-mile-wide study corridors and allow for users such as horse-back riding, hiking, and mountain biking. Non-motorized trails tend to be in areas that allow the user to be in a natural setting with few human modifications. The scenic, cultural, and recreational trails in the 2-mile-wide study corridors are discussed in Section 3.2.2. Historic and scenic trails are discussed in Section 3.2.7.

3.2.13.5 Off-Highway Vehicle and Other Motorized Trails

OHV use occurs throughout the Project area and is a popular dispersed recreation activity in the study area. These activities mainly occur in areas with motorized trails that also allow for OHV users to set up dispersed camp sites. The BLM's OHV designations are determined through travel management planning and are incorporated into their RMPs. All the OHV areas on BLM-administered lands that are crossed by the Proposed Action or the alternative routes are identified in the RMPs as limited or designated and defined in 43 CFR 8342.1. OHV areas that are within the 2-mile-wide study corridor are defined in Table 3-85 and Table 3-86.

The three main designations are "open," "limited," or "closed" to OHV use and are described in Table 3-83. Designations are made through the land-use planning process and are updated and revised as needed to meet resource management objectives and to mitigate OHV-related impacts.

Table 3-83
Off-Highway Vehicle Use Designations

Designation	Use
Open	Area of intensive OHV use with no resource, user, or public safety conflicts ▪ Vehicle travel permitted both on and off roads ▪ Vehicle must be operated responsibly and must not cause significant damage to resources or to other authorized uses of public land
Limited	Restricted OHV use to meet specific resource management objectives ▪ Vehicle travel permitted only on existing roads and trails in existence prior to the designation ▪ Vehicle travel permitted only on designated roads and trails that are identified, signed, and mapped by the BLM ▪ Vehicle travel limited by the number and type of vehicle ▪ Vehicle travel limited by time or season ▪ Vehicle travel limited to licensed or permitted use
Closed	▪ Prohibited OHV use to protect resources, ensure visitor safety, or reduce conflicts ▪ Vehicle travel not allowed both on or off roads and trails access by non-motorized vehicle is generally allowed

3.2.13.6 Scenic Byways and Backways

Scenic byways and backways are designated at a national, state, or local level. The National Scenic Byways Program (23 U.S.C. 162) is managed by the FHWA under the USDOT, which recognizes roads that have outstanding scenic, historic, cultural, natural, recreational, and/or archaeological qualities. The National Scenic Byways Program provides funding to states and Native American tribes for the implementation of projects to protect the features the byways are designated for, as well as to provide interpretative sites for users and maintain facilities along the byways (FHWA 2014). Other scenic byways are identified by states and counties that are managed at a state or local level.

3.2.13.7 Recreation Opportunity Spectrum

The Recreation Opportunity Spectrum (ROS) is a form of zoning in which inventories of lands are arranged along a continuum that is divided into six classes or zones, ranging from natural, low-use areas (resource-dependent recreational opportunities) to highly developed, intensive use areas (facility/vehicle-dependent recreational opportunities). The six classes included in the ROS are primitive, semiprimitive non-motorized, semiprimitive motorized, roaded natural, rural, and urban. The principal factor in determining an ROS class is the setting. The setting describes the overall outdoor environment of a given area, which ultimately influences the types of opportunities and the experiences that take place in that area. Therefore, to enable the recreational manager to achieve the goal of providing opportunities for satisfying recreational experiences, he or she must provide settings that promote varying types of recreational opportunities. Table 3-84 describes the six classifications of ROS settings as well as a description of the types of experiences that each setting encourages.

Table 3-84
Recreation Management Spectrum Classifications and Settings Summary

Area Type	Setting Characterization	Experience Characterization
Primitive	Unmodified natural environment, large in size, user interaction is low, minimal evidence of other users, motorized use not permitted, minimal evidence of human-induced restrictions or controls.	High probability of isolation, closeness to nature, tranquility, self-reliance through the application of woodsman and outdoor skills in an environment that offers a high degree of challenge and risk.
Semi-Primitive Non-Motorized	Natural environment, moderate to large size, low user interaction, evidence of other users, minimum onsite controls and restrictions, motorized use is not permitted.	High, but not extremely high, probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance through the application of woodsman and outdoor skills in an environment that offers challenge and risk.
Semi-Primitive Motorized	Predominantly natural or natural-appearing environment of moderate to large size. Concentration of users is low but there is often evidence of other users. Minimum onsite controls and restrictions may be present but are subtle. Motorized use is permitted.	Moderate probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance through the application of woodsman and outdoor skills in an environment that offers challenge and risk. High degree of interaction with the natural environment.
Roaded Natural	Predominantly natural appearing environment, moderate evidence of the sights and sounds of man, low to moderate user interaction, evidence of other users prevalent. Resources modification and utilization practices are evident. Conventional motorized use is provided for in construction standards and design of facilities.	About equal probability of experiencing affiliation with other user groups for isolation from sights and sound of humans. There is opportunity to have a high degree of interaction with the natural environment. Challenge and risk opportunities associated with more primitive types of recreation are not very important. Practice and testing of outdoor skills might be important.
Rural	Substantially modified natural environment. Resource modification and utilization practices are to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of humans are readily evident; user interaction is moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities available for special activities. Moderate densities are provided far away from developed sites. Facilities for intensified motorized use and parking are available.	Probability of experiencing affiliation with individuals and groups prevalent, as is the convenience of sites and opportunities. These factors are generally more important than the setting of the physical environment. Opportunities for wildland challenges, risk-taking, and testing of outdoor skills are generally unimportant except for specific activities like downhill skiing, for which challenge and risk taking are important elements.
Urban	Substantially urbanized environment. Renewable resource modification and utilization practices are to enhance specific recreation activities. Vegetative cover is often exotic and manicured. Sights and sounds of humans onsite are predominant. Large numbers of users can be expected, both onsite and in nearby areas. Facilities for highly intensified motor use and parking are available with forms of mass transit often available to carry people throughout the site.	Probability of experiencing affiliation with individuals and groups is prevalent, as is the convenience of sites and opportunities. Experiencing natural environments, having challenges and risks afforded by the natural environment, and using outdoor skills are relatively unimportant. Opportunities for competitive and spectator sports and for passive uses of highly human-influenced parks and open spaces are common.

SOURCE: BLM 2009b

3.2.13.7.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Table 3-85 describes the recreation resources crossed by the 2-mile-wide study corridors in Segment 1.

Table 3-85
Recreation Resources in the 2-Mile-Wide Study Corridors in Segment 1

Name	Description	Management
Recreation Areas		
Green and New Fork Rivers –Lower Zone	SRMA	Support wildlife habitat and livestock grazing needs, control soil erosion, provide riparian stability, control noxious weeds, and protect special status species.
North and South Long Island Green River fishing access sites.	These are walk-in access sites for the upper Green River	Dispersed recreation, fishing access
Trails		
No motorized or non-motorized trails present. For National Trails Systems, please refer to Section 3.2.7.		
Off-Highway Vehicle Recreation		
Closed	An area where off-road vehicle use is prohibited. Use of off-road vehicles in closed areas may be allowed for certain reasons but must be approved by the BLM Authorized Officer.	Lands managed by the BLM
Limited	Restricted at certain times, in certain areas, and/or to certain vehicular use.	OHV Seasonal restrictions.
Limited to Existing Roads	OHV use limited to existing roads.	Motorized vehicle use, except for over-the-snow equipment, is limited to existing roads and trails.
Scenic Byways and Backways		
None	Not applicable	Not applicable
Recreation Opportunity Spectrum		
Roaded Natural	Opportunity to have a high degree of interaction with the natural environment.	Conventional motorized use is provided for in construction standards and design of facilities.
Rural	Opportunities for wildland challenges, risk-taking, and testing of outdoor skills	Utilization practices are to enhance specific recreation activities

SOURCE: GIS Analysis using BLM-provided GIS data completed on June 10, 2015, by EPG.

3.2.13.7.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Recreation resources crossed by the 2-mile-wide study corridors in Segment 2 and are shown in Table 3-86.

Table 3-86 Recreation Resources in the 2-Mile-Wide Study Corridors in Segment 2		
Name	**Description**	**Management**
Recreation Areas		
Boars Tusk	Hiking, camping, rock hounding, sightseeing	Lands managed by the BLM.
CDNST Destination SRMA	Cultural site visitation, photography, horseback riding, hiking, hunting, mountain biking	Long-term protection of recreation outcomes and settings
CDNST ERMA	Lands within 0.25 mile of the CDNST, from Happy Springs Oil Field east to the Lander Field Office boundary in the Crooks Gap area	Limit recreational-use impacts, ensure visitor safety, reduce recreational conflicts, and support the nature and purpose of the CDNST.
Green Mountain ERMA	Recreation sites, national and regional trails, local system trails, trailheads and interpretive sites with exceptional recreational values or significant public interest.	Open to major and minor rights-of-way subject to: timing limitations to avoid big game hunting seasons (September 1 through November 15) and relocation and/or mitigation to meet VRM classes, protect visitor safety, and avoid subjecting visitors to the sights and sounds of industrial development.
Killpecker Sand Dunes SRMA	Off-highway vehicle use in an open-play fashion	Lands managed by the BLM. OHV use allowed only in the Sand Dunes Open Play area and only on active sand dunes.
Lander	ERMA	Management focus on recreation to provide extensive and unstructured type of recreation activities.
Oregon Mormon Pioneer California	Protect the quality of cultural, natural, and historic values, and to protect certain trail corridors in their natural condition so as to provide for outdoor recreation and public use.	Right-of-way crossings may be made. Stipulations will be developed that govern exact crossing and restoration procedures.
Pilot Butte Overlook	Pilot Butte Overlook is a destination location on the Pilot Butte Wild Horse Scenic Loop	Managed for limited development, prohibits ground disturbance and surface occupancy.
Boars Tusk	Hiking, camping, rock hounding, sightseeing	Lands managed by the BLM.
Steamboat Mountain	ACEC, CAP under development	Recreational use permitted, CAP to be developed by the BLM will provide more specific management direction.
Western ERMA	During development involving ground-disturbing or disruptive activity, consider these management objectives: provide for the health and safety of visitors, prevent or mitigate resource damage resulting from recreational uses, and minimize conflicts and adverse impacts on recreational opportunities.	Buried utilities will be allowed with adequate reclamation. Above-ground facilities will be avoided unless adequately mitigated to protect the viewshed.
Wind River Front SRMA (Wind River Special Recreation Area West)	(1) Provide protection and enhancement of the recreation opportunities, activities, and setting of the area; (2) Maintain the high visual values of the area; (3) Protect air quality in the adjacent Class I airshed; (4) Maintain or enhance biological diversity; (5) Prevent fragmentation of grasslands,	Ground-disturbing activities in the western unit will be limited through controlled surface use requirements or closing areas.

Table 3-86 Recreation Resources in the 2-Mile-Wide Study Corridors in Segment 2		
Name	**Description**	**Management**
	shrublands, streams, wetlands, and forest habitats; and (6) Maintain crucial big game habitats and migration corridors so that WGFD population objectives can be met	
Trails		
No motorized or non-motorized trails present. For National Trails Systems, please refer to Section 3.2.7.		
Off-Highway Vehicle Recreation		
Open	Vehicle travel permitted both on and off roads	Lands managed by the BLM
Limited to Existing Roads	OHV use limited designated to existing roads.	Lands managed by the BLM
Closed	An area where off-road vehicle use is prohibited. Use of off-road vehicles in closed areas may be allowed for certain reasons but must be approved by the Authorized Officer.	Closed to off-road vehicle use to protect naturalness and outstanding opportunities for solitude, or primitive and unconfined recreation.
Designated	Motorized vehicles must stay on designated roads, unless allowed an exception by the Authorized Officer.	Transportation planning will be completed to identify the designated roads and trails.
Scenic Byways and Backways		
Red Desert Backcountry Byway	Scenic byway, length unknown.	Managed by the BLM in the Red Desert Watershed Management Area.
Pilot Butte Wild Horse Scenic Tour	24-mile-long scenic byway route along County Road 53	Managed by Sweetwater County
Recreation Opportunity Spectrum		
Rural	Opportunities for wildland challenges, risk-taking, and testing of outdoor skills	Characterized by a substantially modified natural environment. Developed sites, roads, and trails are designed for moderate to high uses.
Roaded Natural	Opportunity to have a high degree of interaction with the natural environment. Concentration of users is low to moderate but facilities for group activities may be present.	Equal opportunity to affiliate with other groups or be isolated from sights and sounds of man.
Semi-Primitive Motorized	Minimum onsite controls and restrictions may be present but are subtle. High degree of interaction with the natural environment.	Minimum on-site controls and restrictions
Semi-Primitive Non-motorized	Concentration of users is low but there is high degree of interaction with the natural environment.	Minimum on-site controls and restrictions, motorized use is not permitted
SOURCE: GIS Analysis using BLM provided GIS data completed on June 10, 2015, by EPG.		

3.2.13.7.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Recreation resources crossed by the 2-mile-wide study corridors in Segment 3 are shown in Table 3-87.

Table 3-87 Recreation Resources in the 2-Mile-Wide Study Corridors in Segment 3		
Name	**Description**	**Management**
Recreation Areas		
CDNST SRMA	Cultural site visitation, photography, horseback riding, hiking, hunting, mountain biking	Long-term protection of recreation outcomes and settings
Green Mountain	ERMA	Management focus on recreation to provide extensive and unstructured type of recreation activities.
Lander	ERMA	Management focus on recreation to provide extensive and unstructured type of recreation activities.
Lysite Badlands	ERMA	Management focus on recreation to provide extensive and unstructured type of recreation activities.
NHTs Destination SRMA (National Historic Trails Group Use Reenactment Recreation Management Zone)	Cultural site visitation and/or learning, photography, and historic reenactments	Identifies and protects historic routes, historic remnants, and artifacts for public use and enjoyment.
Unnamed Campground	Dispersed Campground	Allows for camping in undeveloped areas with limited facilities.
Trails		
No motorized or non-motorized trails present. For National Trails Systems, please refer to Section 3.2.7.		
Off-Highway Vehicle Recreation		
None	Not applicable	Not applicable
Scenic Byways and Backways		
South Big Horn/Red Wall	102-mile-long Back Country Byway. Provides semiprimitive recreational experience. It begins and ends by leaving U.S. 20/26 in central Wyoming west of Casper and east of Shoshone.	Maintain intact crucial wildlife habitats, unique vegetative communities, unfragmented habitats, significant cultural sites, and open space.
Recreation Opportunity Spectrum		
None	Not applicable	Not applicable
SOURCE: GIS Analysis using BLM provided GIS data completed on June 10, 2015, by EPG.		

3.2.14 Social and Economic Conditions

3.2.14.1 Regulatory Framework

The BLM (2005) Land Use Planning Handbook (H-1601-1) specifies that the social and economic environment must be considered for all BLM-administered lands land-use planning decisions. Additionally, in accordance with this handbook, by statute, regulation, and executive order, the BLM must use social science in the preparation of informed, sustainable land-use planning decisions. Further, as noted in the BLM NEPA Handbook H-1790-1 (BLM 2008a), socioeconomic issues typically occur in communities located outside BLM-administered lands. Nevertheless, the BLM must analyze the impacts of a given decision or project on the social and economic resources of a community or region.

Section 202(c)(2) of the FLPMA requires the BLM to integrate physical, biological, economic, and other sciences in developing land-use plans (43 U.S.C. 1712(c)(2)). FLPMA regulations 43 CFR 1610.4-3 and 1610.4-6 also require the BLM to analyze social, economic, and institutional information. Section 102(2)(A) of NEPA requires federal agencies to "insure the integrated use of the natural and social science in planning and decision making" (42 U.S.C. 4332(2)(A)). Federal agencies are also required to

"identify and address" disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States" in accordance with Executive Order 12898."

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, was signed by President Clinton in 1994. The executive order requires agencies to advance environmental justice by pursuing fair treatment and meaningful involvement of minority and low-income populations. Fair treatment means such groups should not bear a disproportionately high share of negative environmental consequences from federal programs, policies, decisions, or operations. Meaningful involvement means federal officials actively promote opportunities for public participation, and federal decisions can be materially affected by participating groups and individuals.

3.2.14.2 Regional Setting

Project alternative routes cross Sublette County, Sweetwater County, Fremont County, and Natrona County in central Wyoming. The largest cities in the study area are Casper and Rock Springs. Casper is in Natrona County, approximately 40 miles east of the eastern end of the pipeline at Powder River. Casper is the regional center of commerce and has a long history of energy related economic activity. The city also has a local community college, Casper College. Rock Springs is in Sweetwater County and is the home of Western Wyoming Community College. Mining and resource extraction are major drivers in the local economy. Trona mining and processing is especially important in the region. Other large employers include oil and gas companies, a phosphate manufacturer, and coal mining companies (Graff 2014, BLM 2015b).

The next largest communities in the study area include Lander, which is approximately 60 miles northwest of the proposed pipeline, and Riverton, which is about 80 miles west of the Natrona Hub. The economy of Lander is largely dependent on outdoor recreation and tourism due to its proximity to the Wind River Mountain Range. Public sector and agricultural employment are also major components of the local economy (City of Lander n.d.). Riverton's employment is heavily concentrated in education, health services, retail, and increasingly in the energy industry (City of Riverton 2009). Except for these cities, the majority of the study area is rural and sparsely populated.

As shown in Table 3-88, much of the surface land in the socioeconomic study area is owned by the federal government. Sublette County has the highest percentage of federally owned surface acres (78 percent), while Natrona County has the least (43 percent). The federal agencies with the largest surface land holdings are the BLM and the USFS. In Sweetwater County, approximately 65 percent of surface land is owned by the BLM. Natrona County has the most privately owned land (44 percent).

Table 3-88
Percentage of Surface Land Ownership

Land Owner	Wyoming	County			
		Fremont	Natrona	Sublette	Sweetwater
Federal	48	54	43	78	69
USFS	15	17	0	37	1
BLM	28	35	42	41	65
Other agencies	3	27	1	0	0
State of Wyoming	6	5	12	4	3
Local Government	0	0	0	0	0
Private	42	13	44	18	27

SOURCE: Wyoming Economic Analysis Division 2015a
NOTE: The federal agency rights-of-way may not total to the federal government right-of-way due to rounding.

Despite being the smallest state in the country by population, Wyoming is a national player in the energy industry. It is a leading producer of coal, uranium, natural gas, and crude oil. As of 2014, Wyoming was the fifth largest producer of natural gas and eighth largest crude oil producer in the nation. Wyoming has had extensive oil and gas production since the 1800s, but recent technological enhancements in drilling techniques have revitalized existing plays. Additionally, increased pipeline capacity has opened new opportunities for development ("What's Next for America's Biggest Oil & Gas Producing States").

A 2008 economic analysis study done for the Wyoming Heritage Foundation estimated the effects of the oil and gas industry on the state's economy and found that roughly 43 percent of gross state product was related to oil and gas activity. Per the same study, nearly 20 percent of total employment in the state was related to the oil and gas industry. These estimates include the gross product and employment in other industries that are supported by oil and gas activity (Booze Allen Hamilton 2008).

3.2.14.3 Population

Population estimates and projections for the study area were collected from the U.S. Census Bureau and the Wyoming Community Development Authority. Table 3-89 below shows historic, current, and projected populations for the study area.

Table 3-89
Population

Area	2000[1]	2014[2]	Percentage Change (2000 to 2014)	2020[3]	Percentage Change (2014 to 2020)
Wyoming	493,782	584,153	18	616,140	5
Fremont County	35,804	40,703	14	42,120	3
Natrona County	66,533	81,624	23	88,980	9
Sublette County	5,920	10,057	70	10,140	1
Sweetwater County	37,613	45,010	20	47,170	5

SOURCES:
[1]U.S. Census Bureau 2000
[2]U.S. Census Bureau 2015
[3]Wyoming Economic Analysis Division 2015b

3.2.14.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

The Segment 1 Proposed Action and alternative routes would be entirely within the boundaries of Sublette County. As shown in Table 3-89 above, the state grew 18 percent from approximately 494,000 people between 2000 and 2014. Of all the counties crossed by the proposed pipeline, Sublette County is the smallest with only 10,057 people, but was also the fastest growing from 2000 through 2014. Sublette County grew 70 percent between 2000 and 2014, but is projected to only 1 percent more through 2020.

3.2.14.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Segment 2 of the Project crosses Sublette and Sweetwater Counties in Wyoming. A small portion of all Segment 2 alternative routes also enter a sparsely populated portion of Fremont County; however, for simplicity, Fremont County is discussed in the analysis of Segment 3.

The current population of Sweetwater County is nearly four times as large as Sublette County with nearly 41,000 people.

Sweetwater County grew approximately 20 percent between 2000 and 2014 and is projected to grow 5 percent between 2014 and 2020. By 2020 Sweetwater County is projected to have roughly 47,200 residents.

3.2.14.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Segment 3 of the Project would cross Fremont County and Natrona County. Natrona County is the largest county crossed by the proposed pipeline. As of 2014 it had approximately 81,600 people. The population of Fremont county is about half that of Natrona County with 40,703 people in 2014. From 2000 through 2014, Natrona County's population grew more rapidly than Wyoming as a whole, while Fremont County's population grew more slowly. Natrona County grew 23 percent between 2000 and 2014, while Fremont County grew 14 percent and Wyoming grew 18 percent during the same time period.

Natrona County and Fremont County are projected to grow 9 and 3 percent, respectively, between 2014 and 2020.

3.2.14.4 Economy, Employment, and Income

Two estimates of employment are typically used to describe employment in an area: civilian labor force and employment by industry. The Bureau of Labor Statistics (BLS) defines the civilian labor force on the basis of individuals in the population who are 16 years and over and either employed or actively seeking work. Labor force statistics are shown in Table 3-90.

Table 3-90
Labor Force

	Wyoming	County			
		Fremont	Natrona	Sublette	Sweetwater
Labor force (2000)[1]	266,810	17,664	36,524	3,559	20,709
Labor force (2014)[2]	306,932	20,620	43,305	4,874	23,353
Labor force, average annual growth rate (2000 to 2014) (percent)	1.0	1.1	1.2	2.3	0.9
Employed (2014)[2]	293,690	19,550	41,486	4,656	22,381
Unemployment rate (2014)[2] (percent)	4.3	5.2	4.2	4.5	4.2

SOURCES:
[1]BLS 2000
[2]BLS 2014

Employment-by-industry data, on the other hand, reflects jobs by "place of work" and includes both part-time and full-time jobs. Individuals with more than one job are counted only once in civilian labor force data and counted in each job in the employment-by-industry data. Employment-by-industry data reported by the U.S. Department of Commerce Bureau of Economic Analysis (BEA) reports these data by major industrial classification at the state and County level (BEA 2013a). Data for 2003 and 2013 are shown in Table 3-91 on the following page.

Table 3-91
Full and Part-Time Employment by Industry

	Wyoming		County							
			Fremont		Natrona		Sublette		Sweetwater	
	2003	2013	2003	2013	2003	2013	2003	2013	2003	2013
Total employment	335,584	395,312	21,401	24,688	45,923	56,735	4,795	7,576	24,641	30,476
Agricultural, forestry, fisheries, etc.	14,628	15,596	1,435	1,736	503	495	492	561	210	269
Mining	21,189	34,492	492	1,430	3,577	6,431	662	1,571	(D)	6,330
Construction	27,313	29,899	1,662	1,456	3,322	4,430	592	988	2,018	2,013
Manufacturing	10,661	11,512	593	429	1,721	1,970	(D)	64	1,212	1,531
Wholesale and retail trade	46,677	48,655	2,504	2,925	8,338	9,127	479	560	2,914	2,926
Transportation, warehousing, and utilities	13,843	17,577	535	684	(D)	1,814	131	394	1,198	1,752
Information	4,852	4,657	327	235	605	532	46	37	255	218
Finance, insurance, and real estate	22,179	33,668	1,205	1,714	3,636	4,920	269	570	1,232	2,028
Professional, educational, and technical services	17,322	21,610	755	960	2,447	2,781	228	(D)	708	1,072
Other services	89,755	101,909	3,704	4,010	14,434	17,479	735	1,132	4,298	6,081
Government	67,165	75,737	5,264	6,185	5,738	6,207	763	1,112	4,229	4,841

SOURCES: BEA 2003a and 2013a
NOTES:
Table includes full and part-time employment, not the number of employed persons.
Total employment may not sum to total due to privacy non-disclosures.
(D) indicates that data were not disclosed for that sector for that year.

Table 3-92 below shows the percentage change in employment by industry between 2000 and 2013.

Table 3-92
Percentage of Change in Employment (2000 to 2013)

	Wyoming	County			
		Fremont	Natrona	Sublette	Sweetwater
Total employment	18	15	24	58	24
Agricultural, forestry, fisheries, etc.	7	21	-2	14	28
Mining	63	191	80	137	(D)
Construction	9	-12	33	67	0
Manufacturing	8	-28	14	(D)	26
Wholesale and retail trade	4	17	9	17	0
Transportation, warehousing, and utilities	27	28	(D)	201	46
Information	-4	-28	-12	-20	-15
Finance, insurance, and real estate	52	42	35	112	65
Professional, educational, and technical services	25	27	14	(D)	51
Other services	14	8	21	54	41
Government	13	17	8	46	14

SOURCES: BEA 2003 and 2013a
NOTES:
Table includes full and part-time employment, not the number of employed persons.
Total employment may not sum to total due to privacy non-disclosures.
(D) indicates that data were not disclosed for that sector for that year.

Incomes and wages are another way to measure economic conditions in an area. The BEA also reports total compensation by industry, which can be used in conjunction with the table above to calculate average compensation per job by industry, as shown in Table 3-93. BEA defines compensation to include employer contributions to employee pension and insurance funds, and employer contributions to government social insurance (e.g., Social Security and Medicare), as well as salaries and wages.

Table 3-93
Average Compensation per Job by Industry (2013 in dollars)

	Wyoming	County			
		Fremont	Natrona	Sublette	Sweetwater
Total employment	43,908	37,519	47,150	50,908	60,240
Agricultural, forestry, fisheries, etc.	12,160	9,302	15,000	15,121	6,703
Mining	77,954	74,738	71,123	96,962	103,024
Construction	47,197	33,933	51,119	57,456	55,934
Manufacturing	64,568	28,373	63,844	35,938	105,310
Wholesale and retail trade	34,547	29,723	44,109	25,334	29,004
Transportation, warehousing, and utilities	68,603	51,500	64,156	65,924	69,856
Information	4,657	4,658	4,659	4,660	4,661
Finance, insurance, and real estate	21,550	25,156	28,380	18,944	34,350
Professional, educational, and technical services	40,514	39,844	47,858	(D)	57,834
Other services	20,628	8,434	25,735	11,087	16,772
Government	62,741	56,284	65,570	67,296	20,801

SOURCES: BEA 2013a; 2013c
NOTES:
Table includes full and part-time employment, not the number of employed persons.
Total employment may not sum to total due to privacy non-disclosures.
(D) indicates that data were not disclosed for that sector for that year.

Per capita income, median household income and the percentage of the population living below federally defined poverty levels are useful metrics for assessing economic conditions in local areas. Per capita income is reported by the BEA whereas median household income and poverty statistics are reported by the American Community Survey (ACS).

Table 3-94
Income

	Wyoming	County			
		Fremont	Natrona	Sublette	Sweetwater
Per capita income (2013)[1]	$52,826	$43,781	$58,983	$60,572	$58,077
Median household income (2009 to 2013)[2]	$57,406	$50,418	$57,791	$77,900	$71,525
Percentage of population living below poverty level (2009 to 2013)[2]	11.5	15.0	9.9	6.1	11.3

SOURCES:
[1]BEA 2013b
[2]U.S. Census Bureau 2013

Personal income statistics, such as per capita income and median household income, include income from a variety of sources. The BEA reports the sources of aggregate personal income for local areas. These sources include earnings, transfer payments, and dividends, interest and rent. The relative size of these components of personal income can indicate whether a local economy is primarily dependent on worker earnings, or relies heavily on other sources of income such as retiree wealth and benefits or transfer payments from government sources.

Net earnings, as reported in Table 3-95, reflect wage and salary income – which BEA adjusts to exclude employers' social insurance contributions, and adjusts for county-to-county commuting flows to convert to net earnings by county of worker residence. Transfer payments are benefits that residents receive without providing current services in return. The largest components of income from transfer payments are retirement and disability benefits, medical benefits, income maintenance benefits, unemployment insurance compensation and veterans' benefits. The dividends, interest, and rent category of personal income is sometimes referred to as "property income" and reflects income resulting from individual's ownership of assets such as stocks, bonds, rental properties and the like.

Table 3-95
Percentage of Source of Income (2013)

	Wyoming	County			
		Fremont	Natrona	Sublette	Sweetwater
Net earnings	59.2	52.0	63.0	68.1	76.0
Transfer payments	12.3	19.0	11.0	7.2	9.0
Dividends, interest, and rent	28.5	30.0	26.0	24.8	15.0

SOURCE: BEA 2013d

3.2.14.4.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

3.2.14.4.1.1 Economy

Sublette County is a rural county and most the economic activity is related to resource extraction. Natural gas activity is particularly important in Sublette County, which produced approximately 48 percent of the state's natural gas in 2012 (Drean 2014). The Jonah Field, a large natural gas field in the Green River Basin, is in Sublette County. This is a tight natural gas field that presented technical challenges until the early 1990s when fracturing technology enabled oil companies to begin large scale production. By

December 2000 there were more than 1,300 wells in the field. Since 2000 the pace of drilling in the field has varied with the overall economy and the price of natural gas. The Pinedale Anticline Natural Gas Field, which has one of the richest concentrations of natural gas in the U.S., is also located in Sublette County, near the Jonah Field. This field was not economically viable until a few years after production started in the Jonah Field (Noble 2015).

3.2.14.4.1.2 Employment

The overall civilian labor force has increased across Wyoming and in Sublette County since 2000; however, Sublette County's labor force has grown at more than double the statewide growth rate. As shown previously in Table 3-90, Sublette County's labor force grew approximately 2.3 percent annually between 2000 and 2014 while the statewide labor force only grew 1 percent per year. In 2014, 4,656 of Sublette County's labor force of 4,874 people were employed. The unemployment rate in the county was 4.5 percent, slightly higher than the state unemployment rate of 4.3 percent.

From 2003 to 2013, total employment in Sublette County grew by approximately 2,800 jobs, or 58 percent, from 4,795 to 7,576 jobs in 2013 (as shown in Table 3-91 and Table 3-92). The sectors with the largest growth were mining, transportation, and finance/insurance/real estate, each of which more than doubled during the 10-year period. Only the information sector shrank during this period.

Mining is the largest employment sector in the county, and supports more than 1,500 jobs. The next largest sectors are general services and government, which each support approximately 1,100 jobs. The construction industry also supports roughly 1,000 jobs. The smallest employment sectors in the county are information and manufacturing, which have approximately 37 and 64 jobs respectively.

3.2.14.4.1.3 Income

Sublette County has the second highest average compensation per job in the study area ($50,908), as shown in Table 3-93. Mining jobs have the highest average compensation, followed by government; transportation, warehousing, and utilities; and construction. The industries with the lowest average compensation include agriculture, general services, and information.

Per the ACS, incomes in Sublette County are above statewide values, as shown in Table 3-94. During the 2009 to 2013 period, per capita income in Sublette County was $60,572 compared to $52,826 across the state and the median household income in the county was $77,900 versus the state median of $57,406.

The total percentage of the population living below the poverty line in Sublette County was 6.1 percent, which is below the percentage of statewide population living below the poverty level.

The largest source of income is earnings by place of work. In 2013, this was higher in Sublette County (68 percent) compared to the statewide average of 59 percent. Dividends, interest, and rent are a larger source of income than net transfer payments.

3.2.14.4.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

An overview of Sublette County is provided in Section 3.2.14.3.1.

3.2.14.4.2.1 Economy

The economy of Sweetwater County is also largely dependent on resource extraction. Like Sublette County, Sweetwater County has productive natural gas plays, and produces nearly 12 percent of Wyoming's 2012 natural gas production. However, in addition to oil and gas production, Sweetwater County is also one of the largest producers of trona in the world. First excavated in the area in 1946, trona

is a mineral used to make soda ash. Soda ash is then used in the production of products such as glass, paper, laundry detergent, and baking soda. Today there are several trona mines in the county as well as processing plants and a baking soda plant (City of Green River n.d.).

3.2.14.4.2.2 Employment

Consistent with the population figures discussed previously, Sweetwater County has a much larger labor force than Sublette County. As shown previously in Table 3-90, approximately 22,380 of Sweetwater County's 23,350 members of the 2014 labor force were employed. The Sweetwater County labor force, however, has not grown as rapidly in recent years as in Sublette County. The Sublette County labor force had an average annual growth rate of 2.3 percent between 2000 and 2014 whereas Sweetwater County's labor force grew an average of 0.9 percent annually. In 2014, the unemployment rate in Sweetwater County (4.2 percent) and Sublette County (4.5 percent) was like Wyoming (4.3 percent).

Sweetwater County has more jobs across almost all industry sectors than Sublette County; however, the distribution of employment by sector is relatively similar between the two counties as shown in Table 3-91. Sublette County does have a higher share of agricultural jobs (7 percent compared to Sweetwater County's 1 percent) and construction accounts for 13 percent of employment in Sublette County compared to 7 percent in Sweetwater County. Sweetwater County has a higher percentage of manufacturing, service, and transportation jobs than Sublette County. Mining is the largest employment sector in both counties, followed by services and then government.

3.2.14.4.2.3 Income

Income in Sublette County was described in Section 3.2.14.5. In Sweetwater County, the industries with the highest average compensation include manufacturing and mining. The jobs with the lowest average compensation are in the same industries as in Sublette County.

Both counties crossed by Segment 2 have higher incomes than the statewide average, as shown earlier in Table 3-94. Per the BEA, 2013 per capita income was $60,572 in Sublette County, $58,077 in Sweetwater County, and $52,826 statewide. Median household income over the 5-year period from 2009 to 2013 was higher in Sublette County than in Sweetwater County, at $77,900 in Sublette County compared to $71,525 in Sweetwater County. Sweetwater County also had a higher percentage of people living below the poverty level than Sublette County from 2009 to 2013.

As was indicated in Table 3-95, the largest source of income in Sublette and Sweetwater Counties are net earnings, followed by dividends, interest, and rent. Dividends, income, and rent comprise a larger portion of incomes in Sublette County than Sweetwater County. Net transfer payments make up the smallest portion of income in both counties, although it is a larger portion in Sweetwater County than Sublette County.

3.2.14.4.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

3.2.14.4.3.1 Economy

Economic activity in Fremont County is primarily concentrated in Lander and Riverton, the two incorporated municipalities in the county. The economy of Lander is largely dependent on outdoor recreation and tourism due to its proximity to the Wind River Mountain Range. For example, the international headquarters of the National Outdoor Leadership School is in Lander. There is also a large national bronze foundry, Eagle Bronze. Public sector and agricultural employment are also major components of the local economy (City of Lander n.d.). Riverton's employment is heavily concentrated in education, health services, retail, and increasingly in the energy industry (City of Riverton 2009). Like

Lander, Riverton also has an outdoor activity industry, and is home to a manufacturer of technical outdoor gear such as compasses and binoculars.

Natrona County has the largest economy in the study area, and Casper Wyoming is the second largest city in the state (after Cheyenne). Though Casper historically started as a ranching community, the economy has diversified over time. The oil and gas industry has been an important source of economic activity in the area for many years. Casper has had many refineries over the years and Sinclair Oil Corporation continues to operate a refinery outside Casper in Evansville. Since it is a relatively large city in Wyoming, Casper also has medical center and an acute care hospital that services much of the state.

3.2.14.4.3.2 Employment

As of 2013, Natrona County had the largest total employment in the Project study area with nearly 57,000 jobs (as shown previously in Table 3-91. Fremont County had about 24,700 jobs. The largest employment sector in Natrona County was "other services" (which excludes professional, technical and educational services), which had approximately 17,500 jobs. The second largest sector is wholesale and retail trade, followed by mining, and then government. In the past 10 years, the mining industry grew the fastest, from 3,577 to 6,431 jobs. There has been growth in all industries in the county except agriculture and information, both of which have had slight decreases in the number of jobs.

In Fremont County, government was the largest sector with 6,185 jobs. Other services and wholesale and retail trade are the next largest sectors in the county. Like Natrona County, the fastest growing sector in Fremont County was mining. Employment in manufacturing and information sectors decreased from 2003 to 2013.

3.2.14.4.3.3 Income

Fremont and Natrona Counties have lower average compensation per job than either county crossed by Segments 1 and 2 of the Project (Table 3-93). In 2013, Fremont County had an average compensation per job of $37,519 while Natrona County had an average of $47,150 per job. In both counties, mining had the highest average compensation and information jobs had the lowest. Across all industries, except mining, the average compensation was higher in Natrona County than in Fremont County.

Fremont County had the lowest personal income levels in the study area in 2013, as shown in Table 3-94. Per capita income in the county was $43,781 and the median household income was $50,481. These income measures were about 15 to 20 percent below comparable metrics for Wyoming. Natrona County had a per capita income of $58,983 and median income of $57,791. The 15 percent of the population living below the poverty level in Fremont County during the period from 2009 to 2013 was also higher than elsewhere in the study area (Table 3-94).

As shown in Table 3-95, Fremont County's economy relies more on sources of income other than work earnings than the other counties in the study area. About half of personal incomes in Fremont County came from earnings, while 19 percent came from transfer payments and 30 percent from dividends, interest, and rent. In Natrona County, a larger portion of income came from earnings (63 percent). Of the other sources of income, approximately 11 percent came from transfer payments and 26 percent from dividends, interest, and rent.

3.2.14.5 Local Taxes and Government Revenue

States and counties generate revenue to operate through federal funding for programs like education and transportation, as well as by collecting taxes, licensing fees, permit fees, penalties, and other revenues. Tax revenues are generated by the collection of sales, income, corporate, lodging, and property taxes, and used to fund public services. Authorization of the Project has the potential to generate property and sales

and use tax revenues for local agencies. The largest sources of tax revenues for local governments, and the revenue sources most likely to be affected by the Project, are property taxes and sales taxes, shown in Table 3-96. Investment in developing the Project would increase assessed property values due to the value of the plant and pipelines which would produce property taxes for local governments, while economic activity resulting from construction activity would produce state and local sales tax revenues during the construction period.

Table 3-96
Tax Revenue (2014 in dollars)

	Wyoming	County			
		Fremont	Natrona	Sublette	Sweetwater
Property taxes	1,552,111,794	67,662,291	99,077,826	202,236,614	190,736,068
Sales and use taxes	539,395,251	18,467,982	60,381,850	13,665,138	59,232,752

SOURCE: Wyoming Department of Revenue 2014

3.2.14.5.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

The largest sources of local government income across the state are property taxes. Per Sublette County, almost 96 percent of the county's assessed value is from mineral and industry valuation classes and 3 percent is residential. Commercial, agricultural, and utilities all account for less than 1 percent of assessed value in the county (Sublette County 2014). Sublette County received more than $202 million in property taxes in 2014, the most of any county in the study area. This compares to $13.7 million in sales taxes, as shown in Table 3-96.

3.2.14.5.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Due to the robust energy industry in Sublette County, Sublette County collected slightly more in property tax revenues than Sweetwater County in 2014. Sublette County collected more than $202 million in property tax revenues and Sweetwater County collected nearly $190 million (Table 3-96).

However, since Sweetwater County has a larger population and a larger labor force, the county generates more sales tax revenues than Sublette County. Sublette County collected $13.7 million in sales tax revenues while Sweetwater County collected more than $59.2 million, as shown in Table 3-96.

3.2.14.5.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Both Fremont County and Natrona County have less oil and gas activity than Sublette and Sweetwater counties. Accordingly, they collect less property tax revenues than either county crossed by Segments 1 and 2. As shown in Table 3-96, Fremont County collected approximately $67.7 million in property taxes and $18.5 million in sales tax. Natrona County collected roughly $99 million and $60 million in property and sales taxes, respectively.

3.2.14.6 Housing

The Proposed Action and all alternative routes would cross generally rural landscape that is largely undeveloped, except for a few small population centers along the alternative routes. Pipeline construction workers would need to be housed in reasonable proximity to construction staging areas. As with any new development, pipelines also have the potential, either real or perceived, to affect residential property values.

Housing data for the study area are reported by the U.S. Census, ACS, and the Wyoming Community Development Authority. The Wyoming Community Development Authority reports vacancy rates twice a year, once in June and once in November, as shown in Table 3-97. Rental vacancy rates are shown for both different time periods in 2014 because vacancy rates can change quickly and often vary by season.

Table 3-97
Housing

	Wyoming	County			
		Fremont	Natrona	Sublette	Sweetwater
Total housing units (2000)[1]	223,854	15,541	29,882	3,552	15,921
Total housing units (2009 to 2013)[2]	263,040	17,698	34,363	5,766	16,682
Total owner-occupied (2009 to 2013)[2]	156,202	11,100	21,685	2,607	11,928
Total renter-occupied (2009 to 2013)[2]	66,644	4,325	9,431	895	4,754
Rental vacancy rate (June. 2014)[3] (percent)	3.9	3.4	2.7	7.2	4.1
Rental vacancy rate (November 2014)[3] (percent)	4.7	8.4	3.7	11.8	6.9
Vacant units for rent[3]	5,920	387	606	255	509

SOURCES:
[1]U.S. Census Bureau 2000
[2]U.S. Census Bureau 2013
[3]Wyoming Community Development Authority 2015

Other measures of housing characteristics include property values and monthly rents. Median home values and median contract rents (which exclude utility expenditures) are shown in Table 3-98.

Table 3-98
Home Values

	Wyoming	County			
		Fremont	Natrona	Sublette	Sweetwater
Median Home Value (2000)[1]	$96,600	$89,300	$84,600	$112,000	$104,200
Median Home Value (2009 to 2013)[2]	$185,900	$181,000	$178,300	$282,800	$177,300
Percentage change (in nominal dollars)	92	103	111	153	70
Percentage change – adjusted for inflation[3]	47	55	61	93	30
Median contract rent[2]	$647	$520	$674	$979	$789

SOURCES:
[1]U.S. Census Bureau 2000
[2]U.S. Census Bureau 2013
NOTE: Inflation adjusted change calculated by converting median home value over 2009 to 2013 period to year 2000 dollars for comparison. BLS consumer price indices for year 2011 and year 2000 used for this conversion.

3.2.14.6.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

As shown in Table 3-97, Sublette County added over 2,000 housing units after year 2000, and had 5,766 units by 2013, of which 2,607 were owner-occupied. In Sublette County and Wyoming, the rental vacancy rate is higher in the winter than in the summer. The county vacancy rate was 7.2 percent in summer 2014 and 11.8 percent in winter 2014. The statewide vacancy rate was 3.9 percent in June and 4.7 percent in November.

There are vacant rental housing units potentially available for the Project's construction workforce in Sublette County. Per data from the ACS for the years 2009 to 2013 (reported by the Wyoming

Community Development Authority in 2015) 255 units are available for rent in Sublette County. Apart from rental housing, motels and recreational vehicle parks Segment 1 may be able to provide other potential accommodations for short-term residents. There are seven relatively large hotels and motels in the Pinedale area, with a total of over 400 rooms, as well as several smaller bed and breakfast or cabin-type short-term lodging options (Visit Pinedale 2016).

As shown in Table 3-98, between 2000 and the period from 2009 to 2013, median home values in Wyoming nearly doubled from $96,600 to $185,900. Adjusted for inflation, the statewide median home value increased by 47 percent over this time frame. In Sublette County, property values rose 153 percent from $112,000 to $282,800 in nominal dollars, equivalent to a 93 percent increase after adjusting for inflation, during the same period. Sublette County had the highest median rent in the study area during the period from 2009 to 2013. The statewide median rent was $647 compared to the median rent of $979 in Sublette County.

3.2.14.6.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Consistent with the population data, Sweetwater County has a larger housing stock than Sublette County. During the period from 2009 to 2013, Sweetwater County had 16,682 housing units compared to 5,766 in Sublette County. Sweetwater County had 4,754 renter-occupied units and Sublette County had 895 renter-occupied units. During the period from 2009 to 2013, approximately 509 vacant units were available for rent in Sweetwater County (Table 3-97). Apart from rental housing, motels and recreational vehicle parks Segment 2 may be able to provide other potential accommodations for short-term residents. There are more than 2,000 motel and hotel rooms in Rock Springs and Green River (TourWyoming.com 2016).

As shown in Table 3-98, home values and median rent are both higher in Sublette County than in Sweetwater County. The median home values during the period from 2009 to 2013 were $282,800 and $177,300, respectively and median rents were $979 and $789, respectively.

3.2.14.6.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Segment 3 crosses the most populated portion in the study area and this segment also has the largest housing stock, as shown in Table 3-97. During the period from 2009 to 2013, Fremont and Natrona counties had 17,698 and 34,363 total housing units, respectively, of which 4,325 and 9,431 were renter-occupied, respectively. Fremont County typically has a higher rental vacancy rate than Natrona County. In Fremont County, rental vacancies ranged from 3.8 to 8.4 percent during 2014, while they ranged from 2.7 to 3.7 percent in Natrona County. Approximately 600 vacant rental units may be available in Natrona County and less than 400 units may be available in Fremont County. Apart from rental housing, motels and recreational vehicle parks Segment 3 may be able to provide other potential accommodations for short-term residents. Casper has many hotel and motel options available, while Riverton and Lander also provide hotel and motel accommodations.

During the period from 2009 to 2013, Fremont County had a slightly higher median home value at $181,000 compared to $178,300 in Natrona County (as shown in Table 3-98). Natrona County, however, had a higher median rent ($674) during this period than Fremont County ($520).

3.2.14.7 Public Services

Changes in demand for local services are induced by changes in population, workforce, unemployment and the economy. These impacts are analyzed in Chapter 4, but public service providers in the study area are identified here. Given the rural nature of the area, county sheriffs and fire districts typically serve

large geographic areas from small satellite offices or battalions stationed throughout the service area. Some small towns have their own police or fire/EMS department.

Public services agencies throughout the study area are listed below.

Table 3-99
Public Services

Police Service	Location
Sublette County Sheriff [1]	Sublette County
Sweetwater County Sheriff	Sweetwater County
Rock Springs Police Department	Sweetwater County
Green River Police Department	Sweetwater County
Wamsutter Police Department	Sweetwater County
Fremont County Sheriff	Fremont County
Lander Police Department	Fremont County
Fort Washakie Police Department	Fremont County
Riverton City Police Department	Fremont County
Shoshoni City Police Department	Fremont County
Natrona County Sheriff	Natrona County
Mills Police Department	Natrona County
Casper Police Department	Natrona County
Evansville Police Department	Natrona County
Fire/EMS Services	**Location**
Sublette Fire Department[2]	Sublette County
Boulder	Sublette County
Bondurant	Sublette County
Daniel	Sublette County
Pinedale	Sublette County
Big Piney-Marbleton	Sublette County
Eden Valley Fire District	Sweetwater County
Ganger Fire Dept.	Sweetwater County
Rock Springs Fire Department	Sweetwater County
Green River Fire Department	Sweetwater County
Sweetwater Fire District 1	Sweetwater County
Superior Volunteer Fire	Sweetwater County
Lander Fire Department.	Fremont County
Fremont County Fire District	Fremont County
Riverton Volunteer Fire Department	Fremont County
Mills Fire Department	Natrona County
Casper Fire Department	Natrona County
Casper Mountain Fire District	Natrona County
Natrona County Fire Department	Natrona County
Hospitals	**Location**
Memorial Hospital of Sweetwater County	Rock Springs, Sweetwater County
SageWest Health Care - Lander	Riverton, Fremont County
SageWest Health Care - Riverton	Lander, Fremont County
Wyoming Medical Center	Casper, Natrona County

SOURCE: Wyoming Hospital Association n.d.

3.2.14.7.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Sublette County is served by the Sublette County Sheriff and the Sublette County Fire Department. The fire department has five stations throughout the county.

3.2.14.7.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Sublette County police and fire services are identified above.

Sweetwater County is served by the county Sherriff and local police departments in Rock Springs, Green River, and Wamsutter. Fire services in the county include Eden Valley Fire District, Granger Fire Department, Rock Springs Fire Department, Green River Fire Department, Sweetwater Fire District 1, and Superior Volunteer Fire.

3.2.14.7.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Fremont County is served by the Fremont County Sherriff, Lander Police Department, Fort Washakie Police Department, Riverton City Police Department, and Shoshoni Police Department. Fire and EMS services in Fremont County include Lander Fire Department, Fremont County Fire District, and Riverton Volunteer Fire Department.

Natrona County is served by the Natrona County Sherriff, Mills Police Department, Casper Police Department, and Evansville Police Department. Fire and EMS services in Natrona County include the Mills Fire Department, Casper Mountain Fire District, and Natrona County Fire Protection District.

3.2.14.8 Environmental Justice

Environmental justice is defined as the fair treatment and meaningful involvement of all people—regardless of race, ethnicity, or income level—in environmental decision making. Environmental justice programs promote the protection of human health and the environment, empowerment by means of public participation, and the dissemination of relevant information to inform and educate affected communities. Consideration of environmental justice issues is mandated by Executive Order 12898, which was published on February 11, 1994. This executive order requires that all federal agencies incorporate environmental justice into their mission by "identifying and addressing…disproportionately high and adverse human health or environmental effects of their programs, policies and activities on minority populations, low-income populations, and Indian tribes and allowing all portions of the population a meaningful opportunity to participate in the development of, compliance with, and enforcement of federal laws, regulations and policies affecting human health or the environment regardless of race, color, national origin or income." (CEQ 1997).

This section of Chapter 3 assesses the presence and percentage of minority populations, low-income populations, and Indian tribes throughout the four-county study area. In Chapter 4, the Project and alternative routes are evaluated to determine the proximity of environmental justice communities within the four counties to the Project and alternative routes, and whether those communities would experience disproportionately high and adverse impacts as a result of the Project. By establishing a reference population from definable communities and determining whether higher concentrations of environmental justice populations exist in the area of analysis, any disproportionately high or adverse impacts are identified, analyzed, and disclosed herein.

The following discussion of baseline conditions in the study area uses data at the census-tract level to determine if there are environmental justice communities in the study area with meaningfully higher percentages of minority or low-income residents than the state. Census tracts typically include 2,500 to 8,000 people and range in size and geographic area.

CEQ defines a community with potential environmental justice populations as one that has a greater percentage of minority or low-income populations than does an identified reference community. Minority populations are those populations having (1) 50 percent minority population in the affected area, or (2) a meaningfully greater minority population than the reference area (CEQ 1997). CEQ has not specified what percentage of the population can be characterized as "meaningfully greater" to define environmental justice populations. Therefore, for the purposes of this analysis, a conservative approach was used to identify potential environmental justice populations; it is assumed that if the affected area minority and/or poverty status populations are more than 10 percentage points greater than those of the reference area (Wyoming), there may be an environmental justice population of concern. Low-income populations were defined as those individuals and families who are considered to be living below poverty levels. In 2013, the Census Bureau defined poverty-level thresholds for individuals and a family of four as income levels below $11,888 and $23,834, respectively (U.S. Census Bureau 2014).

Minority population data for the states, counties, and census tracts in each analysis area were obtained from the ACS (U.S. Census Bureau 2013). For this analysis, a population is considered a "minority" based on all races and ethnicities that are not "White (Non-Hispanic)."

Low-income populations in an affected area are populations below the annual statistical poverty thresholds published by the Census Bureau's current population reports on income and poverty. Families and persons are classified by the Census Bureau as below poverty level if their total family income or unrelated individual income is less than the poverty threshold specified for the applicable family size, age, and number of related children under 18 years of age. Poverty status is determined for all families (and, by implication, all family members). For persons not in families, poverty status is determined by their income in relation to the appropriate poverty threshold. Thus, two unrelated individuals living together may not have the same poverty status.

For determining the presence of low-income communities as environmental justice populations, census tracts in each analysis area were evaluated against a reference population (the state of Wyoming). Thus, all census tracts where the percentage of the individuals or families living below the poverty level was 10 percentage points or more above the corresponding percentage across Wyoming, or in which the total minority population was over 50 percent, or in which the proportion of residents comprising individual minority groups was 10 percentage points or more than the average proportion of residents from those groups across Wyoming, were considered potential environmental justice populations. Note that census-tracts 9401 through 9405 are all located in the Wind River Indian Reservation and are thus included as potential environmental justice communities, though not these census-tracts meet the demographic or poverty criteria described above.

3.2.14.8.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

None of the census tracts in Sublette County are environmental justice communities.

3.2.14.8.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

While none of the census tracts in Sublette County are environmental justice communities, 3 of the 12 census tracts in Sweetwater County are potential environmental justice communities because of

meaningfully greater concentrations of Hispanic /Latino residents. One of these census-tracts (9708) also has a meaningfully greater concentration of families living below the poverty level.

3.2.14.8.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

In Fremont County, 7 of the 10 census tracts qualify as environmental justice communities due to their location in the Wind River Reservation, their meaningfully greater concentration of American Indian residents, and/or their meaningfully greater proportion of individuals or families living below the poverty level. The Wind River Reservation is home to the Eastern Shoshone Tribe and the Northern Arapaho Tribe.

Only 1 of the 18 census tracts in Natrona County is a potential environmental justice community. Tract 12 has a meaningfully greater proportion of families living below the poverty level than found across Wyoming.

Table 3-100 provides detailed information on the socioeconomic characteristics of the census tracts in the study area for the purposes of identifying potential environmental justice communities.

Table 3-100
2013 Percentage of Minority and Low-Income Populations

Area	Total Population	Percentage								
		White (Non-Hispanic)	Hispanic Latino	African American	American Indian or Alaska Native	Asian	Native Hawaiian or Pacific Islander	Total Minority	Individuals Below Poverty Level	Families Below Poverty Level
Wyoming	570,134	85.2	9.2	0.9	2.3	0.8	0.0	14.8	11.5	7.7
Fremont County										
Census Tract 1	**3,972**	**76.6**	**5.8**	**0.0**	**15.9**	**0.1**	**0.0**	**23.4**	**24.4**	**18.7**
Census Tract 2	3,685	88.7	0.3	0.0	8.0	0.7	0.0	11.3	5.2	1.3
Census Tract 3	4,181	89.3	6.1	0.3	1.6	1.0	0.6	10.7	3.9	3.0
Census Tract 4	1,712	97.3	0.0	0.0	0.9	0.0	0.0	2.7	4.3	2.5
Census Tract 9401	**3,943**	**15.4**	**2.8**	**0.8**	**80.1**	**0.0**	**0.2**	**84.6**	**14.9**	**11.7**
Census Tract 9402.01	**3,979**	**87.9**	**5.8**	**0.0**	**1.8**	**0.0**	**0.0**	**12.1**	**6.7**	**3.5**
Census Tract 9402.02	**4,562**	**40.3**	**5.7**	**0.5**	**56.20**	**0.0**	**0.0**	**59.7**	**16.2**	**12.0**
Census Tract 9403	**5,990**	**76.7**	**7.1**	**1.2**	**13.3**	**1.20**	**0.00**	**23.3**	**30.7**	**23.6**
Census Tract 9404	**5,615**	**79.8**	**8.7**	**0.1**	**10.4**	**1.7**	**0.1**	**20.2**	**14.5**	**11.1**
Census Tract 9405	**2,878**	**72.3**	**14.8**	**0.5**	**13.1**	**0.0**	**0.0**	**27.7**	**17.9**	**13.3**
Natrona County										
Census Tract 2	4,248	66.4	14.1	4.9	3.0	1.2	0.0	33.6	19.0	9.0
Census Tract 3	4,118	80.6	13.7	0.0	3.1	0.4	0.0	19.4	13.5	7.6
Census Tract 4	4,078	90.2	7.3	0.6	2.8	1.7	0.0	9.8	7.5	3.6
Census Tract 5.01	5,452	84.4	8.7	2.5	0.1	3.2	0.0	15.6	8.5	9.5
Census Tract 5.02	3,287	79.3	16.4	0.7	1.3	0.0	0.0	20.7	15.9	11.4
Census Tract 6	7,498	89.6	5.6	0.0	1.2	0.9	0.0	10.4	9.0	6.5
Census Tract 7	2,685	85.3	12.4	0.0	0.0	0.6	0.0	14.7	6.4	7.5
Census Tract 8	3,831	92.4	5.0	0.4	0.7	0.1	0.0	7.6	9.2	5.0
Census Tract 9.01	4,768	90.7	7.4	0.2	0.3	0.4	0.0	9.3	7.8	7.4
Census Tract 9.02	3,878	94.9	2.7	0.8	0.2	0.1	0.0	5.1	0.8	0.0
Census Tract 10	4,714	93.5	3.7	0.4	1.3	0.6	0.0	6.5	8.4	7.3
Census Tract 11	2,547	93.2	4.6	0.8	1.3	0.0	0.0	6.8	21.2	12.8
Census Tract 12	**1,914**	**83.0**	**11.1**	**1.8**	**2.8**	**0.4**	**0.0**	**17.0**	**20.5**	**18.8**
Census Tract 14.01	5,720	88.1	7.9	0.2	0.5	1.5	0.0	11.9	11.8	6.6
Census Tract 16.02	6,079	90.1	6.2	1.4	0.0	0.7	0.0	9.9	5.9	5.1
Census Tract 16.03	3,508	92.3	3.9	0.0	1.2	0.0	0.0	7.7	8.0	5.9

Table 3-100
2013 Percentage of Minority and Low-Income Populations

Area	Total Population	Percentage								
		White (Non-Hispanic)	Hispanic Latino	African American	American Indian or Alaska Native	Asian	Native Hawaiian or Pacific Islander	Total Minority	Individuals Below Poverty Level	Families Below Poverty Level
Census Tract 17	4,593	93.3	4.9	0.0	0.0	0.0	0.0	6.7	9.1	5.3
Census Tract 18	4,425	94.6	2.6	0.3	1.3	0.0	0.0	5.4	7.2	5.5
Sublette County										
Census Tract 1.01	3,980	91.9	3.2	0.0	0.3	0.0	0.1	8.1	8.8	7.4
Census Tract 1.02	6,198	82.1	9.9	0.0	0.4	1.5	0.0	17.9	4.4	3.3
Sweetwater County										
Census Tract 9705	2,788	86.0	7.7	1.1	0.0	0.0	0.0	14.0	9.3	6.0
Census Tract 9706.01	4,608	78.7	17.1	0.1	0.2	0.0	0.0	21.3	17.4	12.3
Census Tract 9706.02	3,758	86.8	11.8	0.0	0.3	0.2	0.0	13.2	7.6	5.9
Census Tract 9707	3,649	89.1	9.4	0.5	0.0	0.0	0.0	10.9	4.6	3.1
Census Tract 9708	**5,736**	**69.4**	**24.5**	**1.2**	**1.0**	**2.2**	**0.0**	**30.6**	**21.4**	**18.4**
Census Tract 9709.01	6,400	83.5	11.6	0.1	0.3	1.0	0.0	16.5	4.6	4.6
Census Tract 9709.02	4,598	78.4	16.6	0.0	0.0	0.3	0.0	21.6	12.2	9.8
Census Tract 9709.03	**2,771**	**68.1**	**25.4**	**1.0**	**0.0**	**0.3**	**0.3**	**31.9**	**17.0**	**14.3**
Census Tract 9710	2,235	79.6	18.2	0.0	0.2	0.0	0.0	20.4	6.6	3.3
Census Tract 9711	**3,259**	**71.8**	**23.8**	**0.0**	**0.9**	**1.7**	**0.0**	**28.2**	**14.8**	**13.5**
Census Tract 9712	2,554	93.6	4.0	1.2	0.0	0.6	0.0	6.4	9.0	5.1
Census Tract 9716	2,081	87.8	9.4	0.3	0.0	0.3	0.0	12.2	6.7	2.3

SOURCE: U.S. Census Bureau 2013
NOTE: Environmental Justice communities are shown in bold.

3.2.15 Soils and Reclamation

Soils are the interface between the lithosphere (Earth's crust) and the biosphere (Earth's surface), and consist of various mineral and organic horizons of differing thickness formed by physical and chemical processes from mineralogical and biological sources (Birkeland 1999). Agency objectives for managing soil resources focus on the preservation of the natural properties of the resource, including soil productivity, surface stability, and reclamation potential.

3.2.15.1 Regulatory Framework

In addition to the requirements of NEPA and FLPMA, the Farmland Protection Policy Act of 1981 requires the assessment of impacts on designated farmland soils from proposed conversion of farmlands to nonagricultural uses.

3.2.15.2 Regional Setting

The Major Land Resource Area (MLRA) for the Project is the Central Desertic Basins and Plateaus. This MLRA is characterized by alluvial fans, piedmont plains, and pediment slopes from the surrounding mountains that form broad intermountain basins. The soils in this MLRA are generally calcareous (high in calcium carbonate) and range from shallow or moderately deep to sedimentary bedrock. Some of the soils formed in slope alluvium or residium derived from shale or sandstone. Soils that formed in stream- or river-deposited alluvium are near the major waterways. The dominant soil orders in the MLRA are aridisols and entisols (SWCA 2014b). Aridisols are well developed soils that have a very low concentration of organic matter and form in an arid or semi-arid climate. Entisols are soils that have only recently formed that lack soil development because erosion or deposition rates occur faster than the rate of soil development (SWCA 2014b).

Other soil orders found in the Project study area include mollisols, inceptisols, alfisols, and spodosols. Mollisols are soils with a thick, friable, very dark-colored, organic-rich surface layer that are naturally fertile, having a high base saturation throughout the profile. Inceptisols have profiles that are more strongly developed than Entisols but are too weakly developed to meet the criteria for other soil orders. Typical settings for Entisols include upland slopes, floodplains, stream terraces, and glacial till and outwash plains. Alfisols have a thin light-colored epipedon surface horizon and a clay-enriched argillic subsurface horizon. Alfisols are developed primarily under forest conditions. Spodosols have a reddish or brownish spodic (i.e., accumulation of translocated organic matter in complex with aluminum and commonly iron) subsoil horizon. Spodosols are most extensive in areas of cool, moist climates forming mostly in sandy or loamy parent materials under coniferous forest vegetation.

3.2.15.3 Soil Types

In this section, soil types are grouped into their orders and suborders with a description, and the characteristics of each type are summarized.

Soils subject to water erosion include steeply sloping land with shallow soils. Highly wind-erodible soils along the proposed alternative pipeline routes are associated with sandy and silty textured and sparsely vegetated soils on a variety of parent materials. Although accelerated erosion due to construction-related soil disturbance could occur at any stage of construction, the maximum potential for erosion in the construction right-of-way would be expected while soils are loose on top of the soil surface in spoil piles. Erosion also would be of concern after final grading has occurred but before a vegetative cover has been re-established. If the ground surface was left smooth and bare during this period, winds could dislodge soil particles and rainfall intercepting bare surfaces could result in increased erosion.

Most the study area consists of a range and shrublands on gently rolling to moderately steep slopes that have low/medium/or high potential for erosion.

Soil susceptibilities to water and wind erosion were assessed based on standards from the NRCS. The susceptibility of a soil to water erosion is based on its assigned Kw value, a numerical factor representing the relative water erodibility of the whole soil. Soils assigned a Kw value of 0.40 or higher have a high susceptibility to water erosion; whereas soils assigned a Kw value between 0.20 and 0.40 have a moderate susceptibility to water erosion. Soils assigned a Kw value below 0.20 have a low susceptibility to water erosion.

Soils are grouped based on their susceptibility of a soil to wind erosion and assigned to a Wind Erodibility Index (WEI). The WEI is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year than can be expected to be lost to wind erosion and is based on soil texture and the relationship of dry soil aggregates greater than 0.84 mm to potential erosion rates of 0 to 310 tons/acre/year from a wide bare field (NRCS 2016). Soils assigned to WEI 160-310 (tons/acres/year) are highly susceptible to wind erosion and have a surface layer that is very fine sand, fine sand, sand or coarse sand; soils assigned to WEI 134 also are highly susceptible to wind erosion, but have a surface layer consisting of loamy very fine sand, loamy fine sand, loamy sand, and loamy coarse sand with 5 or less percent clay and 25 or less percent very fine; soils assigned to WEI 86 have a moderate susceptibility to wind erosion and have a surface layer with a greater clay content than those with a WEI of 134; and soils assigned to WEI 38-56 have a low susceptibility to wind erosion and have surface layers that are noncalcareous with greater clay content than those in WEI 86 or have high content of iron oxide and are Oxisols or Ultisols; WEI of 0 means soils have no susceptibility to wind erosion and have a surface layer of rocks or pararocks, or due to wetness. For this document, WEIs of 134 to 310 were grouped as being highly susceptible to wind erosion, WEIS of 86 were considered to be moderately susceptible to wind erosion, and those WEIs of 38 to 56 were considered to have low susceptibility to wind erosion.

3.2.15.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Segment 1 consists of 69 percent aridisols (argids, calcids, and cambids), 13 percent entisols (orthents and psamments), 6.5 percent mollisols (cryolls, aquolls, and ustolls), 6.5 percent inceptisols (aquepts and cryepts), and 5 percent alfisols (cryalfs and ustalfs).

3.2.15.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Segment 2 consists of 90 percent aridisols (argids, cambids, and calcids), 8 percent entisols (fluvents and psamments), 1 percent mollisols (cryolls and aquolls), and 1 percent spodosolls (orthids).

3.2.15.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Segment 3 consists of 52 percent aridisols (argids, cambids, and calcids), 46 percent entisols (fluvents, orthents, aquents, and psamments), 1.5 percent mollisols (aquolls, borolls, cryolls, and ustolls), and less than 1 percent for spodosolls and inceptisols.

3.2.15.4 Prime Farmland Soils

No Prime Farmlands would be crossed by the Project.

3.2.15.5 Hydric Soils

Hydric soils are sufficiently wet in the upper layer to develop anaerobic conditions during the growing season. Although not extensive throughout Wyoming, hydric soils do occur in many of the counties in Wyoming. In Wyoming, most of the hydric soils occur in floodplains and drainageways, but can also be present in swales, playas, and draws. Hydric soils may indicate the presence of wetlands or agricultural drain tiles (SWCA 2014b).

3.2.15.5.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

In Sublette County, there were 2.91 miles identified as having hydric soils (SWCA 2014b).

3.2.15.5.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

In Sweetwater County, there were 17.5 miles identified as having hydric soils (SWCA 2014b).

3.2.15.5.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

In Fremont County, there were 17 miles identified as having hydric soils, and for Natrona County there were zero miles identified as having hydric soils (SWCA 2014b).

3.2.15.6 Compaction Potential

The susceptibility of soils to compaction was based on the content of their clay. Those soils with percentages of clay equal to or greater than 28 percent were considered to be susceptible to compaction.

Soil compaction occurs when soil particles are pressed together and the pore spaces between them are reduced and bulk density is increased. Moist fine-textured soils are most susceptible to severe compaction. However, compaction may occur on loamy to coarse textured soils and under drier conditions due to multiple passes by heavy mechanical equipment.

The degree of compaction would depend on the moisture content and texture of the soil at the time of construction. Compaction would be most severe where heavy equipment operates on moist to wet soils with high clay contents. Detrimental compaction also can occur on soils of various textures and moisture contents if multiple passes are made by high ground-weight equipment. If soils are moist or wet where topsoil trenching has occurred, topsoil may adhere to tires and/or tracked vehicles and be carried away. Rutting restrictions would help to mitigate these concerns. Heavy construction equipment, such as dozers, graders, and backhoes, especially those with tracks, would cause the greatest compaction. Areas with high traffic in soils prone to compaction would also increase the compaction potential. The Applicant will try and minimize the compaction of soils by not upgrading or widening existing roads to the extent practicable or avoiding those areas with compaction-prone soils whenever possible.

Soil that is excessively compacted is limited in its ability to function. Compaction damages soil structure and reduces pore space, which impedes the movement of air and water to plant roots and can result in lower growth rates and can hinder revegetation. Compaction reduces infiltration and results in excessive surface runoff, erosion, nutrient loss, and potential water quality problems. Detrimental soil compaction, when extreme and unmitigated, can directly result in a reduction in soil productivity. Compacted soils, when not mitigated, could create conditions that promote invasive weed infestation. Soils susceptible to compaction were identified by those soils having a clay percentage greater or equal to 28 percent in the upper 20 inches of soil.

3.2.15.6.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

For Segment 1, 17 percent of the soils have a clay content equal to or greater than 28 percent.

3.2.15.6.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

For Segment 2, 11 percent of the soils have a clay content equal to or greater than 28 percent.

3.2.15.6.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

For Segment 3, 26 percent of the soils have a clay content equal to or greater than 28 percent.

3.2.15.7 Erosion Potential

3.2.15.7.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

For Segment 1, 10 percent of the soils crossed have a high susceptibility to water erosion (k factor of greater than or equal to 0.40), 61 percent have a moderate susceptibility to water erosion (k factor of 0.20-0.39), and 29 percent have a low susceptibility to water erosion (k factor less than or equal to 0.19). Additionally, Segment 1 crosses 12 percent of soils having a high susceptibility to wind erosion (WEI 134-310), 49 percent have a moderate susceptibility to wind erosion (WEI 86), 36 percent have a low susceptibility to wind erosion (WEI 38-56), and 3 percent have no susceptibility to wind erosion (WEI 0).

3.2.15.7.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

For Segment 2, 13 percent of the soils crossed have a high susceptibility to water erosion, 55 percent have a moderate susceptibility to water erosion, and 32 percent have a low susceptibility to water erosion. Additionally, Segment 2 crosses 6 percent of soils having a high susceptibility to wind erosion, 62 percent with a moderate susceptibility to wind erosion, 29 percent with a low susceptibility to wind erosion, and 3 percent with no susceptibility to wind erosion.

3.2.15.7.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

For Segment 3, 6 percent of the soils crossed have a high susceptibility to water erosion, 79 percent have a moderate susceptibility to water erosion, and 15 percent have a low susceptibility to water erosion. Additionally, Segment 3 crosses 10 percent of soils with a high susceptibility to wind erosion, 62 percent with a moderate susceptibility to wind erosion, 26 percent with a low susceptibility to wind erosion, and 2 percent with no susceptibility to wind erosion.

3.2.15.8 Reclamation Potential

Reclamation potential is based on several factors, including soil conditions, biological soil crusts, badlands topography, slope, rock outcrops, soil texture, percentage of sodium or pH, and highly erosive soils. Soils with low reclamation potential could be have a variety, or combination of, factors including steep slopes, sandy and clay texture, rocky, and high pH or salts. Soils with moderate reclamation potential could have a variety, or combination of factors such as moderate slope, loam and silt texture, and moderate salts. Soils with high reclamation potential could have a variety or combination of factors such as a relatively flat surface, loam texture, and low salt content.

3.2.15.8.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

For Segment 1, 15 percent of the soils crossed have a high reclamation potential, 57 percent have a moderate reclamation potential, and 28 percent have a low reclamation potential.

3.2.15.8.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

For Segment 2, 14 percent of the soils crossed have a high reclamation potential, 46 percent have a moderate reclamation potential, and 40 percent have a low reclamation potential.

3.2.15.8.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

For Segment 3, 45 percent of the soils crossed have a high reclamation potential, 16 percent have a moderate reclamation potential, and 39 percent have a low reclamation potential.

3.2.16 Special Designations

The following section examines special designations within the 2-mile-wide study corridors. Special designations crossed by the study corridors include ACECs, WSAs, other management areas, and conservation easements. The management plans relevant to the Project area are discussed in Section 1.6.2. A resource report prepared by the Applicant (SWCA 2014c) was used as the basis for this inventory, and updated and supplemented with BLM and secondary source GIS spatial data and aerial photo interpretation.

3.2.16.1 Regulatory Framework

Special designations fall in to two categories: (1) congressional designations, and (2) administrative designations (e.g., those applied by the BLM through the land-use planning process (BLM 2005). Congressional designations include national monuments, national conservation areas, WSAs, and national recreation areas. (Note: Refer to Sections 3.2.2 and 3.2.7 for information regarding national scenic and historic trails.) Administrative designations discussed in this section include ACECs other management areas, and conservation easements. Other administrative designations include BLM Scenic or Back Country Byways national recreation trails and wildlife viewing sites (discussed in Section 3.2.13) and wild horse and burro ranges (discussed in Section 3.2.22). The special designations management is prescribed for each area aimed at either conserving the unique values of the area or to meet management objectives identified for an area. The management is presented in the relevant land-use-plans (i.e., RMPs) or in the case of conservation easements, the deed for an easement.

ACECs are areas of BLM-administered lands where special management attention is needed to protect and prevent irreparable damage to important resources. To be designated an ACEC, the area must meet the criteria of relevance and importance (43 CFR 1610.7-2 and BLM Manual 1613). Areas meeting the relevance criterion possess significant historic, cultural, or scenic values; fish or wildlife resources including Threatened and Endangered species; or natural hazards. To meet the importance criterion, the resource must have substantial significance and value. This generally requires qualities of more than local significance and special worth, consequence, meaning, distinctiveness, or cause for concern. A natural hazard can be important if it is a significant threat to human life or property (BLM 2013j).

WSAs are roadless areas that have been inventoried and found to have wilderness characteristics as defined in Section 2(c) of the Wilderness Act of 1964. WSAs are managed under BLM Manual 6330. BLM's policy is to continue resource uses on lands designated as WSAs in a manner that maintains the

area's suitability for preservation as wilderness. These characteristics require an area to generally appear in a natural state and be substantially unaffected by the actions of humans. The area should encompass at least 5,000 acres to make practicable its preservation and to offer opportunities for solitude or a primitive and unconfined type of recreation. Although not a required characteristic, the area may also contain ecological, geological, or other features of scientific, educational, scenic, or historic value. In 1976 Congress directed the BLM through Section 603(a) of the FLPMA to inventory, study, and recommend to Congress by 1991, through the Secretary of the Interior and the President, public lands suitable or unsuitable for wilderness designation (BLM 2004a). In addition, BLM Manual 6330 indicates that the BLM will review all proposals for uses and/or facilities in WSAs to ascertain whether the proposal would impair the suitability of the WSA for preservation as wilderness.

Other management areas are areas that are administratively designated by an authorized officer for the special management and identification of control measures to protect resources. Conservation easements are a voluntary, legally binding agreement with private landowners that limit certain types of uses or prevent development from taking place on a piece of property while protecting the property's ecological or open-space values. Under a conservation easement, the landowner voluntarily agrees to give up or sell certain rights, such as dividing or developing the property; and a private organization or a public agency agrees to enforce the conservation easement agreement. Funding for conservation easements can come from many different sources, including state agencies and private entities. Pursuant to 16 U.S.C. 460nnn (4)(A), the term 'conservation easement' means "a binding contractual agreement between the Secretary and a landowner in the Cooperative Management and Protection Area under which the landowner, permanently or during a period specified in the agreement, agrees to conserve or restore habitat, open space, scenic, or other ecological resource values on the land covered by the easement."

3.2.16.2 Regional Setting

There are several different special designations and other management areas that occur in the study corridors. This includes 1 ACEC, 6 other management areas, and 2 conservation easements.

3.2.16.3 Areas of Critical Environmental Concern

3.2.16.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

There are no ACECs crossed by the 2-mile-wide study corridors in Segment 1 of the Project area.

3.2.16.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Table 3-101 lists the ACECs crossed by the 2-mile-wide study corridors in Segment 2.

Table 3-101
Areas of Critical Environmental Concern in Segment 2

Name of Area of Critical Environmental Concern	Relevant and Important Values	Relevant Management Prescriptions	Relevant Alternative Route
Greater Sand Dunes	Primitive and Unconfined Recreation, Ecological, Geological and Paleontological Values, High Quality Scenery; Oil and Gas Development and Livestock grazing.	Avoidance area for land-use authorizations including rights-of-way	Alternative 2B: Southern Route

SOURCE: GIS Analysis using BLM provided GIS data completed on June 10, 2015, by EPG.

3.2.16.3.2.1 Greater Sand Dunes

The Greater Sand Dunes ACEC met the relevance and importance criteria in 1982 for outstanding geologic features, prehistoric and historic values of national significance, and recreation values of regional and national importance. Management objectives preserve and protect the integrity of these unique values in the area for future public use and enjoyment. The ACEC is unique to the Wyoming Basin and contains values that are "geologically, aesthetically, and biologically interesting" (McGrew et al. 1976).

The Greater Sand Dunes are part of the larger Killpecker dune field, the largest active dune field in North America. The Killpecker dune field encompasses approximately 109,000 acres, extending 55 miles east from the Green River Basin across the Continental Divide into the Great Divide Basin. The ACEC comprises approximately 41,600 acres (approximately 38 percent of the Killpecker dune field) (BLM 2013b). There is a high potential for unrecorded archaeological and historic sites to occur in this area. Boars Tusk, a remnant volcanic neck, is an unusual geologic feature that lies in the Greater Sand Dunes ACEC (BLM 2004a). For additional information related to the Boars Tusk area, refer to Section 3.2.8.

The dunes in the Greater Sand Dunes ACEC help to support the Steamboat elk herd known to occupy this unique desert habitat. Elk occupy the area during the spring and fall, using dunal ponds (flockets) as a source of water. The dunal ponds generally are not as alkaline as other water sources in the area and are known to provide an oasis for plants and animals. The dunal ponds also provide excellent habitat for waterfowl, amphibians, songbirds, and small mammals (BLM 2004a).

The western portion of Greater Sand Dunes ACEC encompasses some of the Sand Dunes and Buffalo Hump WSAs. These WSAs are managed under the BLM Interim Management Policy for Lands Under Wilderness Review (BLM Manual 6330), as discussed above. The eastern portion of Greater Sand Dunes ACEC incorporates the boundary of the Greater Sand Dunes SRMA, which offers outstanding motorized recreational values. The historic Crookston Ranch is also located in the ACEC (BLM 2004a).

There are two ACECs with cultural components in the vicinity of the Project study area for Segment 2: White Mountain Petroglyphs ACEC (managed by the BLM Rock Springs Field Office) and the South Pass Historic Landscape (managed by the BLM Lander and Rock Springs Field Offices).

The White Mountain Petroglyphs ACEC is approximately 4 miles south of Alternative 2B: Southern Route, outside of the Project study area. The White Mountain Petroglyphs ACEC was established to protect cultural resources values from degradation and provide for wildlife and scenic values and Native American concern (BLM 1997). It encompassed an approximately 20-acre area and contains multiple rock art panels (primarily petroglyphs), which are important resources to the Shoshone-Bannock Tribes of the Fort Hall Reservation, the Northern Arapaho Tribe of the Wind River Reservation, and the Ute Indian Tribe of the Uintah and Ouray Reservation.

The closest ACEC to Alternative 2A: Proposed Action in Segment 2 is South Pass Historic Landscape, located 5 miles to the north, outside of the study corridor. This ACEC was designated in the Green River RMP to recognize and manage the South Pass area (BLM 1997). This is where the Oregon NHT, Mormon Pioneer NHT, California NHT, and the Pony Express NHT cross the Continental Divide.

3.2.16.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

There are no ACECs crossed by the 2-mile-wide study corridors in Segment 3 of the Project.

3.2.16.4 Wilderness Study Areas

3.2.16.4.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

There are no WSAs crossed by the 2-mile-wide study corridors in Segment 1 of the Project.

3.2.16.4.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Table 3-102 lists the WSAs crossed by the 2-mile-wide study corridors in Segment 2 of the Project.

Table 3-102
Wilderness Study Areas in Segment 2

Wilderness Study Area	Relevant and Important Values	Relevant Management Prescriptions	Relevant Alternative Route
Sand Dunes	Recreation, high quality scenery, archaeological values, hunting	No ground disturbance for land-use authorizations including rights-of-way	Alternative 2B: Southern Route
Alkali Draw	Recreation, high quality scenery, ecological, geological, educational, scientific, historic	No ground disturbance for land-use authorizations including rights-of-way	Alternative 2A: Proposed Action
South Pinnacles	Recreation, high quality scenery, rock hounding	No ground disturbance for land-use authorizations including rights-of-way	Alternative 2B: Southern Route
Alkali Basin/East Sand Dunes	Recreation, hunting	No ground disturbance for land-use authorizations including rights-of-way	Alternative 2B: Southern Route
Buffalo Hump	Recreation, high quality scenery, archaeological values, hunting	No ground disturbance for land-use authorizations including rights-of-way	Alternative 2B: Southern Route

SOURCE: GIS Analysis using BLM-provided GIS data completed on June 10, 2015 by EPG.

3.2.16.4.2.1 Sand Dunes Wilderness Study Area

Sand Dunes WSA comprises a large part of the Killpecker Sand Dunes and contains large areas of barren active dunes, wet meadows, greasewood, big sagebrush, and rabbit brush communities. A unique feature of the WSA is the Aeolian ice-cells that feed pools at the base of many of the large sand dunes. The naturalness of this WSA is considered exceptional because of the lack of human-made intrusions. The flowing dunes virtually eliminate any evidence of human activity in the area. The Steamboat elk herd uses this area (BLM 2004a).

3.2.16.4.2.2 Alkali Draw Wilderness Study Area

Alkali Draw WSA contains a remnant of the Great Divide Basin-Red Desert area. A series of draws or canyons extend through the WSA, creating a "washboard" topographic effect. Alkali Rim dominates the southern aspect and exhibits colorful blue rock escarpments. Big sagebrush is the dominant vegetation community, with greasewood common along the major drainages. The WSA contains habitat for mule deer and elk. The WSA is in a natural condition, and the human-made intrusions are substantially unnoticeable and undergoing natural revegetation.

3.2.16.4.2.3 South Pinnacles Wilderness Study Area

South Pinnacles WSA contains mostly flat topography with an exposure of broken rim rocks and ridges. Greasewood communities occupy the draws, with big sagebrush in the open areas. The WSA is natural in character and provides opportunities for solitude and varied recreation.

3.2.16.4.2.4 Alkali Basin/East Sand Dunes Wilderness Study Area

The Alkali Basin/East Sand Dunes WSA encompasses 12,800 acres of BLM-administered lands with no private or state inholdings. The study area includes a portion of the Killpecker Sand Dunes. The dunes present a rolling topography with the draws and ridges of Alkali Creek providing topographic relief. Sagebrush and bunchgrass are the principle vegetative species. This area is conducive to unconfined recreation such as horseback riding, hiking, backpacking, nature study and wildlife photography. Valuable pronghorn antelope habitat is found in the WSA, and the Sands elk herd occasionally inhabits the WSA during the winter months. Hunting in the Alkali Basin/East Sand Dunes WSA is mostly for pronghorn antelope and sage grouse (BLM 2013a).

3.2.16.4.2.5 Buffalo Hump Wilderness Study Area

Buffalo Hump WSA has no private or state inholdings. The primary topographic relief consists of sand valleys, blowouts, hills, and dunes with individual dunes exceeding heights of 100 feet. The interdunal areas contain ponds, grass-covered marshes, and playas. The WSA exhibits a natural condition of undisturbed sagebrush-grassland ecosystem intermingled with active sand dunes. The recreation values are outstanding, with opportunities for hiking, backpacking, nature study, photography, hunting, and rock hounding (BLM 2004a).

3.2.16.4.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

There are no WSAs crossed by the 2-mile-wide study corridors in Segment 3.

3.2.16.5 Other Management Areas

A special management area is any area where the BLM has determined resources require special management and control measures for their protection.

3.2.16.5.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

There are no other management areas crossed by the 2-mile-wide study corridors in Segment 1.

3.2.16.5.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Table 3-103 lists the other management areas crossed by the 2-mile-wide study corridors in Segment 2.

Table 3-103
Other Management Areas in Segment 2

Management Area	Relevant and Important Values	Relevant Management Prescriptions	Relevant Alternative Route
Red Desert Watershed	Recreation, ecological, high quality scenery, wildlife viewing	Right-of-way crossings to be assessed on a case-by-case basis.	Alternative 2B: Southern Route
Steamboat Mountain	Recreation, high quality scenery, wildlife viewing, hunting	Avoidance area for land-use authorizations including rights-of-way	Alternative 2A: Proposed Action
West Sand Dunes Archaeological District	Archaeological, education, historic values	Avoidance area for land-use authorizations including rights-of-way	Alternative 2B: Southern Route

Table 3-103
Other Management Areas in Segment 2

Management Area	Relevant and Important Values	Relevant Management Prescriptions	Relevant Alternative Route
Crookston Ranch	Recreation, historic values, educational	Avoidance area for land-use authorizations including rights-of-way	Alternative 2B: Southern Route
Boars Tusk	Recreation, high quality scenery, educational, geological, ecological	Northern portion is Avoidance area for land-use authorizations including rights-of-way/Southern portion to be assessed on a case-by-case basis	Alternative 2B: Southern Route
Wind River Special Recreation Area West	Wildlife habitat, big game migration corridors, scenic quality, recreation values, air quality.	Open to mineral leasing, ground-disturbing activity is limited through controlled surface use requirements.	Alternative 2A: Proposed Action
Designated Development Area	Facilitate exploration and development of renewable and non-renewable energy resources.	Open to minerals exploration, development and production.	All Segment 3 alternative routes
Wind River Basin Management Area	Oil and gas exploration and development	Oil and gas development is a priority with minimum restrictions. Standard stipulations apply.	Alternative 3C: Lost Creek to Highway 20/26

SOURCE: GIS Analysis using BLM-provided GIS data completed on June 10, 2015, by EPG.

3.2.16.5.2.1 Red Desert Watershed Management Area

The Red Desert Watershed was identified as a watershed management area in the Green River RMP. The management objective established for the watershed is management of all resource values in the Red Desert area, with emphasis on protection of visual resources, watershed values, and wildlife resources, and the provision of large areas of unobstructed views for enjoyment of scenic qualities (BLM 2004a).

The Red Desert Watershed comprises one of the last undeveloped high desert regions in the west. It contains unique landforms, colorful badlands, and shifting sand dunes. Much of the Red Desert Watershed still looks the same way it did when the pioneers passed through the Continental Divide on the Oregon and Mormon Pioneer Trails. The Red Desert Watershed also contains portions of four WSAs in the planning area: Alkali Draw, Honeycomb Buttes, Oregon Buttes, and South Pinnacles. Portions of the Oregon Buttes and Steamboat Mountain ACECs are also in the Red Desert Watershed (BLM 2004a).

The Red Desert Watershed falls in the Great Divide Basin, which is a hydrologically closed basin. Most streams are intermittent and flow toward the center of the basin into playa lakes, where they either recharge the aquifers or evaporate. Artesian groundwater and unconfined groundwater are found throughout the watershed area (BLM 2004a).

The Great Divide Basin is a cold, high-elevation desert environment that provides habitat for a variety of wildlife species. Along Bush Rim, Freighter Gap, and other rims surrounding the basin, vegetation is highly variable and provides the most cover and forage. Aspen and limber pines provide cover for big game. South-facing slopes containing serviceberry, mountain mahogany, and currants are favored as big game winter range (BLM 2004a).

3.2.16.5.2.2 Steamboat Mountain Management Area

Steamboat Mountain Management Area is in the Steamboat Mountain ACEC which is 43,270 acres large and located about 1 mile from the Segment 2 study area. This ACEC is managed for the protection of

wildlife habitat, cultural resources and to enhance biodiversity and a healthy ecosystem. Activities in this ACEC are designed to place priority consideration on elk habitat. A CAP was developed by the BLM in 2006 for the Jack Morrow Hills (BLM 2006).

3.2.16.5.2.3 West Sand Dunes Archaeological District Management Area

This archaeological district is a special management area designated to protect stabilized sand dunes and places where buried sediments potentially hold archaeological resources. This area encompasses a 18,650-acre area of the Killpecker Sand Dunes. The archaeological district is located north of White Mountain in Sweetwater County. This area is discussed in detail in the cultural resources Section 3.2.2.

3.2.16.5.2.4 Crookston Ranch

The historic 40-acre Crookston Ranch site is in the ACEC south of the off-road vehicle parking lot. The site is eligible for the NRHP as a representative example of architecture from the Wyoming Basin homesteading era. The site is closed to ground-disturbing activities. The BLM plans to preserve the historic nature of the Crookston Ranch, and develop interpretation on ranching history in the area. About 500 acres of BLM-administered lands surrounding the 40-acre site (the area within a 0.5-mile radius) will be managed to preserve the setting of the historic ranch (Public Lands Information Center 2015).

3.2.16.5.2.5 Boars Tusk

The Boars Tusk area encompasses about 1,400 acres and is managed to protect the unusual geological features associated with sand dunes. The area is closed to surface mining activities, mineral materials sales and the use of blasting and explosives. Off road vehicle use is limited to designated roads and trails in the area, and the road around the Boars Tusk is closed (BLM, Green River RMP). For additional information related to the Boars Tusk area, refer to Section 3.2.8.

3.2.16.5.2.6 Wind River Special Recreation Management Area West

Wind River Front Special Recreation Area (West) is about 172,630 acres and is managed to provide protection and enhancement of recreation opportunities, visual values, and air quality; maintain or enhance biological diversity; prevent fragmentation of habitat; and maintain crucial big game migration corridors. The area is open to mineral leasing. Ground disturbance is limited through controlled surface use requirements or closing areas where maximum resource protection is necessary. Off-road vehicle use is limited to existing designated roads and trails. Surface disturbing activity is prohibited in the Dry Sandy Swales area.

3.2.16.5.2.7 Wind River Basin Management Area

The Wind River Basin Management area is 54, 575 acres and is open to oil and gas exploration and development. This area is identified as having moderate and high oil and gas development potential. New oil and gas leases in this area will be issued with standard stipulations only.

3.2.16.5.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Table 3-104 lists the other management areas crossed by the 2-mile-wide study corridors in Segment 3.

Table 3-104 Other Management Areas in Segment 3			
Management Area	**Relevant Important Values**	**Management Prescriptions Relevant to Oil and Gas Rights-of-Way**	**Relevant Segment**
Wind River Management Area	Crucial wildlife and sage-grouse habitat	No surface-disturbing and wildlife disturbing activities are allowed from November 15 through April 30 on all crucial big game winter ranges.	Segment 3
SOURCE: GIS Analysis using BLM-provided GIS data completed on June 10, 2015, by EPG			

3.2.16.5.3.1 Wind River Management Area

In 2007, the WGFD together with the BLM Casper and Lander Field Offices developed the Wind River/Sweetwater River Local Sage-Grouse Conservation Plan. The Wind River Management Area falls in the Wind River Basin which is addressed in this conservation plan. This effort resulted in the implementation and monitoring plans to track the success of state and federal conservation strategies and voluntary conservation actions (BLM 2007a, 2007b).

3.2.16.6 Conservation Easements

This section examines conservation easements crossed by the 2-mile-wide study corridors by segment in the Project area.

3.2.16.6.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

There are two permanent conservation easements crossed by the 2-mile-wide corridors in Segment 1: Fish Creek Flying W Ranches, Inc. and Cross Lazy Two (Cross Lazy Two L&L Co portion). Fish Creek Flying W Ranches is managed by the WGFD and Cross Lazy Two Ranch is managed by Wyoming Land Trust (Table 3-105).

Table 3-105 Conservation Easements in Segment 1		
Easement or Area	**Type of Easement and Managing Agency**	**Relevant and Important Values and Management Prescriptions Relevant to Oil and Gas Rights-of-Way**
Fish Creek Flying W Ranches, Inc.	WGFD	Permanently limits uses of the land to protect its conservation values
Cross Lazy Two	Wyoming Land Trust	Created to preserve working ranchland, wildlife habitat and scenic views.
Unnamed Conservation Easement	Protection of resources and limitation on development.	Varies according to conservation value identified under each conservation agreement.
SOURCE: GIS Analysis using BLM-provided GIS data completed on June 10, 2015, by EPG.		

3.2.16.6.1.1 Fish Creek Flying W Ranches, Inc.

The 1,530-acre Fish Creek Flying W Ranches comprise two properties, the Johnson Place and the Fish Creek Ranch. The Johnson Place is located approximately 4 miles south of Big Piney and Marbleton, and features nearly 2 miles of Green River frontage and provides valuable riparian habitat for moose, mule deer, bald eagles and a plethora of other wildlife. The Fish Creek Ranch on South Piney Fish Creek Road is approximately 18 miles west of Big Piney and encompasses more than 2 miles of land along the Fish and South Piney Creeks. It serves as a crucial winter range for one of the largest concentrations of Shiras moose along the Wyoming Range, as well as an important movement corridor for both elk and mule deer. The property also provides important brood rearing habitat for sage-grouse (Conservation Fund 2015).

3.2.16.6.1.2 Cross Lazy Two Ranch

Cross Lazy Two Ranch comprises 1,331 acres and is located approximately 5 miles west of Big Piney. It serves as a crucial winter range for moose along the Wyoming Range, as well as an important movement corridor for both elk and mule deer. The property also provides important brood rearing habitat for sage-grouse (National Conservation Easement Database 2014).

3.2.16.6.1.3 Conservation Easement

Numerous conservation easements exist in Segment 1 of the RRNP study area. These areas are managed to protect critical lands in, adjoining, or near public lands. These lands are managed under a legal agreement between the landowner, and the eligible easement holder that restricts future activities on the land to protect conservation values.

3.2.16.6.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

There are no conservation easements crossed by the 2-mile-wide study corridors in Segment 2 of the Project.

3.2.16.6.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

There are no conservation easements crossed by the 2-mile-wide study corridors in Segment 3 of the Project.

3.2.17 Transportation and Access

Federal, state, and local transportation and access facilities and systems are located throughout the Project area, including roadways, airports and aviation facilities, and railroad facilities. Transportation facilities were identified for the potential to be used for construction, operation, and maintenance of the Project.

As part of the EIS process, the POD would be revised to reflect the Preferred Alternative. A Traffic and Transportation Management Plan will also be developed to address regulatory compliance, outline traffic management practices, and identify levels of right-of-way access and agency-required mitigation measures (i.e., the agency-required mitigation measures applied in the EIS, and through agency coordination during the development of the POD, to help reduce impacts related to transportation and the construction of temporary and long-term access in vicinity of the Project). The purpose of the Traffic and Transportation Management Plan would be to provide the BLM, other public agencies, and the Applicant's construction contractor with a description of the type of access associated with the construction, operation, and maintenance of the Project and make evident the potential impacts that could be created by construction and operation of the Project. The goal of the Traffic and Transportation Management Plan would be to ensure impacts from construction of the Project and any associated access are kept to a minimum using management practices and mitigation measures identified as part of the EIS process. The practices and measures that would be included in the plan are intended to mitigate the effects of access for the Project on environmental resources, roads, traffic, travel, and road safety.

3.2.17.1 Regulatory Framework

3.2.17.1.1 Federal Roadways

Section 101 of the National Highway System Designation Act of 1995 (revision of 23 CFR 470) designates the National Highway System in the U.S., including the District of Colombia and the Commonwealth of Puerto Rico, and authorized the Secretary of Transportation to make future modifications to the system. This includes interstates and U.S. highways. The American Association of

State Highway and Transportation Officials and the FHWA are responsible for interstate and U.S. highways in individual states. Design standards, specifications, and guidelines that would be used for design and traffic control on roadways identified for use by the Project would adhere to FHWA protocols in accordance with Wyoming adopted design standards and specifications for federal and state highways/routes.

3.2.17.1.2 State Roadways

WYDOT is responsible for building and maintaining state highways and routes. As discussed above, Wyoming adopts design standards, specifications, and guidelines for state highways and routes as well as the federal interstates and highways.

The WYDOT provides for encroachment and occupancy permits for utility construction and operation activities. Design standards, specifications, and guidelines are defined in WYDOT Road Design Manual (WYDOT 2014) and Standard Plans (WYDOT 2013). Title 24 – Highways, Wyoming State of 1924 (State of Wyoming n.d.), established roads in Wyoming as state or county highways as well as the WYDOT to manage and provide direction.

3.2.17.1.3 Local Roadways

County and local roads have standards set by each county or city to guide the building and maintenance of these roads. Like the WYDOT, counties and cities have encroachment permitting requirements for utility construction and operation activities. Counties may require access permits and road crossing licenses for any utilization or disturbance of county roads for pipeline construction.

3.2.17.1.4 Bureau of Land Management

Roads on BLM-administered lands are typically managed through travel management planning. The BLM travel management plans identify designated areas and roads for type of motorized use, motorized travel restricted areas, and seasonal restrictions. New and improved road construction on BLM-administered lands used for Project construction, operation, and maintenance must meet or exceed the minimum standards of width, alignment, grade, surface, and other requirements identified by the BLM Travel Management Program and the BLM Manual Section 9113 (BLM 2011b). The BLM's 2007 *The Gold Book – Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development* is also an applicable standard for road construction and maintenance on BLM-administered lands (BLM 2007d).

3.2.17.1.5 Railroads

Federal Railroad Administration, USDOT, 49 CFR, applies to all private, common, and contract carriers by rail in interstate and/or intrastate commerce. The FTA and the Federal Railroad Administration regulate railroad operations and each individual state has a railroad commission.

Pipeline utilities will be located to provide a safe environment and shall conform to the current Federal Pipeline Safety Regulations and The American Railway Engineering and Maintenance Association Specifications.

3.2.17.2 Regional Setting

Interstates, U.S. highways, and state highways in Wyoming support high travel speeds and traffic volume and occur in the vicinity of and/or are crossed by Project alternative routes. There are no federal airports located in the 2-mile-wide study corridors; however, two private airstrips are present. Other roadways consisting of the BLM, county, private, and local roads support direct access to livestock/rangeland operations, remote areas for recreational uses, and energy development. These other roadways support

lower speeds and lower volumes of travelers and range from paved two-way roads and graded roads with gravel travel surfaces to two-track roads with native soil surfaces. Seasonal stipulations and/or weather conditions may limit access throughout the year. Railroads in the Wyoming portion of the 2-mile-wide study corridors support energy development and commerce and are typically concentrated in areas adjacent to other linear facilities.

3.2.17.3 Travel Management

3.2.17.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

3.2.17.3.1.1 Roadway Facilities

Roadway facilities that are present in the 2-mile-wide study corridors of Segment 1 are listed in Table 3-106.

Table 3-106
Roadway Facilities Located in Segment 1

Facility Name	Facility Type
Highway 189 (MP 85 to MP 86)	Federal
Highway 235	State
Route 198	County
South Piney West Road	Local
Dry Piney Road	Local
Black Canyon Road	Local

SOURCE: GIS Analysis using ESRI data completed on June 10, 2015, by EPG

Federal

U.S. Highway 189 is a two-lane highway that runs north/south through Segment 1 between Big Piney and La Barge, Wyoming. This facility is a minor arterial with low Annual Average Daily Traffic levels (AADT) of 1,051 with less than 1 percent truck traffic (WYDOT 2013).

State

Wyoming Highway 235 (Big Piney Caplet road) is a two-lane highway that provides a connection between La Barge northwest to the Lincoln/Sublette county line and Calpet. This facility primarily serves oil refineries (WYDOT 2015a). No AADT is available for this segment; however, it can be assumed that most traffic is made up of large trucks associated with oil and gas development.

Local

Areas between the major highways are served by an irregular, complex network of unpaved roads ranging from unmaintained 4-wheel drive trails to gravel-surfaced county roads. In certain energy development areas, the networks are dense, having been constructed for resource development purposes. Notable access points in Segment 1 of the RRNP study area include the following roads:

- South Big Piney Road is a local connector, also called County Road 151. This unpaved roadway is about 6 miles long and serves two lanes of travel. No AADT is available for this facility (WYDOT 2013).
- Dry Piney Road (Route 198) is a local roadway located about 10 miles north of La Barge and provides connection between U.S. 189 and Big Piney Road. This unpaved roadway is about 7 miles long and serves two lanes of traffic. No AADT is available for this facility (WYDOT 2013).

- Black Canyon Road is a local/private dirt road that serves oil and gas development activity east of Big Piney Calpet Road. No AADT data is available for this facility (WYDOT 2013).
- Other unnamed local and private roads and access points exist in the Segment 1 study area that serve private property access and oil and gas development. Traffic on these facilities is likely low volume and associated with private use or oil and gas activity. Potential impacts on transportation facilities will be discussed in Section 4.4.18.

Bureau of Land Management Roads

No BLM roadways are identified in the Segment 1 study area.

Railroad

There are no railroad facilities located in the Segment 1 study area.

3.2.17.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

3.2.17.3.2.1 Roadway Facilities

Roadway facilities that are present within the 2-mile-wide study corridors in Segment 2 are listed below in Table 3-107.

Table 3-107
Roadway Facilities Located in Segment 2

Facility Name	Facility Type
Highway 191 (MP 52 to MP 73)	Federal
Highway 28 (MP 4 to MP 21)	State
County Road 15	County
County Road 17	County
County Road 53	County
18 Mile Road	Local
3 Forks-Atlantic City Road	Local
Bar X Road (Country Road 21)	Local
California-Mormon Road	Local
Crooks Gap Road (County Road 318)	Local
Oregon Buttes Road (County Road 74)	Local
Reardon Draw Road	Local

SOURCES: GIS Analysis using ESRI data completed on June 10, 2015, by EPG; Interactive Transportation Systems Map (WYDOT 2015b)

Federal

U.S. Highway 191 travels from north/south between Pinedale and Rock Springs, Wyoming. This segment is a two-lane paved highway that serves about 2889 AADT with about 17 percent truck travel (WYDOT 2013).

State

Wyoming 28 runs east/west through Eden-Farson Wyoming. This road is a two-lane rural highway that serves about 1362 AADT with 13 percent truck travel. This corridor is to access recreation facilities and by oil and gas industry for transporting equipment between drilling rigs (University of Wyoming 2014).

WY 351 is a 254-mile-long two-lane major collector highway that serves about 871 AADT with 26 percent truck traffic. This roadway mainly serves mining and oil and gas development activity (WYDOT 2013).

Local

Areas between the major highways are served by an irregular, complex network of unpaved roads ranging from unmaintained 4-wheel drive trails to gravel-surfaced county roads. In certain energy development areas, the networks are dense, having been constructed for resource development purposes. Local roads identified in Table 3-107 are smaller facilities that provide access to recreation lands or oil and gas development areas within the Segment 2 study area. No AADT or other traffic data are available for these facilities (WYDOT 2013). Traffic on these facilities is low volume and associated with private use or oil and gas activity.

Coordination with Sweetwater County will be necessary to obtain access permits and road crossing licenses for activity associated with pipeline construction. In addition, coordination with the Sweetwater Public Works Department also will be necessary for dust control, transportation of heavy loads, and Project-related road damage.

Bureau of Land Management Road Facilities:

Ten BLM roads exist within the Segment 2 study area. These facilities are mostly unpaved roads that provide access to BLM-administered lands. No AADT data is available for these facilities.

Railroad

The Union Pacific Railroad runs north/south through the Segment 2 study area and serves the southern portion of Wyoming between Atlantic City and Rock Springs, Wyoming, continuing into Utah and Colorado (WYDOT 2015a).

3.2.17.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

3.2.17.3.3.1 Roadway Facilities

Roadway facilities that are present within the 2-mile-wide study corridors are listed in Table 3-108.

Table 3-108
Roadway Facilities Located in Segment 3

Facility Name	Facility Type
Highway 287 (MP 23 to MP 42)	Federal
Highway 20/26 (MP 201.2)	Federal
Highway 136 (MP 37 to MP 44)	State
Route 211	County
Route 212 (Gas Hills Road)	County
Route 104	County
Route 106	County
2nd St S	Local
Big Eagle Road	Local
Buck Camp Road	Local
Poison Spider Road/County Rd 201	Local
Crooks Gap Road (County Road 318)	Local
Lockhart Ranch Rd	Local
Ore Rd (County Road 5)	Local
Oregon Trail	Local

Table 3-108 Roadway Facilities Located in Segment 3	
Facility Name	**Facility Type**
Castle Garden Road	Local
Gas Plant Rd (County Road 212)	Local
Lost Cabin Road	Local
Scotty Clark Road	Local
1st St South	Local
Aspen Street	Local
Bear River Street	Local
Big Eagle Road	Local
Frenchie Drive	Local
Hillard Street	Local
Lockhart Ranch Road	Local
Steele Street	Local
SOURCES: GIS Analysis using ESRI data completed on June 10, 2015, by EPG; Interactive Transportation Systems Map (WYDOT 2015b)	

Federal

Highway 20 (U.S. 26) is a two-lane federal facility that runs east/west between Moneta and Powder River, Wyoming. This facility carries about 2200 AADT with 14 percent truck traffic (WYDOT 2013a).

U.S. 287 (WY 789) is a two-lane facility that crosses east/west through the Segment 3 study area between Lander and Rawlins, Wyoming. This facility carries about 960 AADT with 14 percent truck traffic (WYDOT 2013)

State

Highway 136 (Gas Hills Road) provides a connection between Ore Road and is a rural two-lane facility that provides north/south access south to Jeffrey City) and Riverton, Wyoming. This is a two-lane facility that carries about 200 AADT with 15 percent truck traffic (WYDOT 2013).

Local

Areas between the major highways are served by an irregular, complex network of unpaved roads ranging from unmaintained 4-wheel drive trails to gravel-surfaced county roads. In certain energy development areas, the networks are dense, having been constructed for resource development purposes. Notable access points in Segment 3 of the RRNP study area include the following roads:

- Route 212 (Dry Creek Road) is an unpaved 24-mile-long county road that mainly serves mining operations between the Natrona/Fremont county line and Waltman, Wyoming. No AADT data is available for this facility (WYDOT 2013). This road also serves recreation activity and private property.
- Route 211 is an unpaved 21-mile-long county road that runs north/south providing access between Powder River, Wyoming and Poison Spider Road (County Road 201). No AADT information is available for this facility (WYDOT 2013). This road mainly serves recreation activity and private property access.
- Route 104 is an unpaved 8-mile long county road that runs north/south between Highway 20 and Arminto, Wyoming. No AADT information is available for this facility (WYDOT 2013). This road primarily serves oil and gas development activity.

- Route 106 is an unpaved 15-mile county road that runs north/south between County Road 108 and Powder River, Wyoming (WYDOT 2013). This road provides recreation transportation access to adjacent lands.
- Poison Spider Road is crossed by the proposed pipeline at about MP 213. This road provides recreation transportation access to adjacent lands. AADT information is not available for this roadway.

Other unnamed local and private roads and access points exist in the Segment 3 study area that serve private property access and oil and gas development. Traffic on these roads is likely low volume and associated with private use or oil and gas activity. Potential impacts on transportation facilities is discussed in Section 4.3.17.

Bureau of Land Management Roads

There are no BLM roads present in Segment 3.

Railroads

The Burlington Santa Fe Railroad runs east/west through the Segment 3 study area parallel to the I-80 corridor. This rail line is used for freight transportation in the northern portion of Wyoming and into Montana. This rail line will be used to transport pipe and construction materials as well as commuting construction personnel for the proposed RRNP.

Aviation Facilities

The Gas Hills Airstrip is 17 miles southwest of Waltman, Wyoming (about 1.75 miles north of Route 212) in the Segment 3 study area. This 32-acre facility is publicly owned and became operational in 1985. The facility is currently operational and serves private users.

3.2.18 Vegetation

This section addresses vegetation communities, special status plant species, and noxious weeds and invasive plant species that may be affected by the Project. Wetland and Riparian vegetation communities are discussed in Section 3.2.21, which addresses issues unique to these vegetation communities. Vegetation communities are defined as distinct assemblages of plant species defined by biological, geomorphological, and ecosystem variables. Noxious weeds are invasive and/or non-native species that have negative consequences on ecosystem function or land uses. Special status plant species include species listed as threatened, endangered, or candidate under the ESA, BLM sensitive species, and species of special concern by the state.

3.2.18.1 Regulatory Framework

In addition to the relevant BLM land-use plans (refer to Section 1.6.2.1), vegetation may be subject to supplemental statutes, regulations, plans, programs, and policies at the tribal, federal, state and local government levels. Regulations, policies, and plans relevant to terrestrial vegetation, including special status plant species and communities of special concern in the study area are primarily implemented by the BLM, the USFWS, and state agencies, including the Wyoming Weed and Pest Council. Further, counties are responsible for maintaining noxious weed lists and local weed management. Regulations, policies, and plans relevant to vegetation in the study area are summarized in this section.

3.2.18.1.1 Federal

- Federal Executive Order 13112: Invasive Species requires that federal agencies take measures to minimize the introduction or spread of invasive species that may result from their actions.

- The ESA authorizes the USFWS to protect and implement recovery plans for species of plants and animals in peril. Under the Section 7 of the Act, federal agencies are required to ensure that their actions are not likely to jeopardize the continued existence of a species listed under the Act as endangered, threatened or candidate.
- FLPMA, as amended (43 U.S.C. 1701), consolidates and articulates the BLM and USFS management responsibilities and governs most uses of the federal lands, including authorization to grant or renew rights-of-way. The agencies must make decisions based on principles of multiple use and sustained yield. As such, a grant of right-of-way must be limited to its necessary use and must contain terms and conditions that reflect the agencies' management responsibilities under FLPMA, including minimizing impacts on fish and wildlife habitat.
- The Carlson-Foley Act (43 U.S.C. 1241) directs federal land-management agencies to destroy noxious weeds growing on land under their jurisdiction, and provides a legal framework for reimbursement of expenses to state or local agencies for weed control on federal land.
- The BLM Washington Office Instructional Bulletin 2012-097, Disposal of Forest Products and Other Vegetative Resources states current BLM policy for any cutting or removal of timber, trees or vegetative resources, including such resources located within the clearing limits of rights-of-way.

3.2.18.1.2 State

- Wyoming Weed and Pest Control Act (Title 11, Chapter 5, Article 1) officially designates the authority of the state of Wyoming to require the control of designated pests and weeds. This act is regulated by the Wyoming Weed and Pest Council.

3.2.18.2 Regional Setting

Geography and geologic features affecting the distribution of vegetation resources are described in this section. Segment 1 of the study area is in the northwestern portion of the Great Divide Basin and bounded by the Wyoming Range to the west and the southern end of the Wind River Range to the northeast. Segment 2 of the study area also is in the Great Divide Basin. The juncture point of Segments 2 and 3 of the study area is an area of lower elevation where the Project alternative routes skirt the Granite Mountains, Ferris Mountains and Rattlesnake Range to the east-southeast and unnamed ranges to the northwest. Segment 3 of the study area is in the Wind River Structural Basin, covering an area that extends to the vicinity of Casper Arch.

The study area is situated near the Wyoming Range, Wind River Range, Granite Mountains, and Great Divide Basin. Notable river channels in the study area include the Green River in Segment 1 and the Sweetwater River in Segment 3. Most the study area is dominated by sagebrush and shrub-steppe vegetation communities.

3.2.18.3 Vegetation Communities

Natural vegetative communities in the Project area were mapped and categorized using the EPA *Ecoregions of North America* classification system (Omernik 1987). The Middle Rockies and Wyoming Basin ecoregions occur in the Project area (Table 3-109).

Vegetative communities in the Project area are mapped and categorized using the National GAP Northwest Gap Analysis Project land cover data (Oregon State University et al. 2008). The GAP completed a land cover map depicting the distribution of ecological systems across the northwestern U.S., including Wyoming, using satellite imagery and other spatial datasets to model vegetation (Oregon State University et al. 2008). A total of 67 GAP land cover categories occur in the Project area. For the

purposes of this analysis, the 67 GAP land cover categories were consolidated and reclassified into 14 primary vegetation communities based on similarities in species composition, vegetative structure, and topographic positioning (Table 3-109). Riparian and wetland areas were identified from the GAP landcover categories; however, the amount and extent of these vegetation communities in the Project area are be discussed in Section 3.2.21.

The Level III ecoregions and GAP vegetation communities in the study area are described in the following sections.

Table 3-109
Vegetation Communities that Occur in Each Segment of the Project Area

Land Cover	Occurs in Segment 1	Occurs in Segment 2	Occurs in Segment 3
Ecoregions			
Middle Rockies	✓		
Wyoming Basin	✓	✓	✓
GAP Vegetation			
Agriculture	✓		✓
Alpine		✓	
Aspen	✓	✓	✓
Barron and Sparsely Vegetated (less than 10 percent cover)	✓	✓	✓
Big Sagebrush	✓	✓	✓
Developed/Disturbed	✓	✓	✓
Grassland	✓	✓	✓
Montane Forest	✓		✓
Mountain Shrub	✓	✓	
Limber Pine – Juniper	✓	✓	✓
Shrub Steppe	✓	✓	✓
Open Water	✓	✓	✓

One BLM Management Area in Segment 1 of the study area, the Ross Butte Management Area, is managed for multiple resources including 19 special status plant species. The Segment 2 study area includes two vegetation related BLM management areas located in the BLM Rock Springs Field Office. The special status plant species ACEC is a specific management area for special status plants. The Oregon Butte ACEC has multiple management resources including vegetation. There are no vegetation-related BLM management areas in the Segment 3 study area.

3.2.18.3.1 Ecoregions

3.2.18.3.1.1 Middle Rockies

The Middle Rockies Ecoregion is in southwestern Montana, eastern Idaho, northern Wyoming, and the Black Hills in western South Dakota and northeastern Wyoming. The climate is severe, mid-latitude, humid continental and lacks a strong maritime influence due to the Columbia Mountains/Northern Rockies (Commission for Environmental Cooperation 2011). The terrain includes high alpine glaciated mountains, plateaus, and glacial and lacustrine intermontane basins. Common woody vegetation in the alpine areas include Douglas fir, lodgepole pine, aspen, subalpine fir and Engelmann spruce forests. In the basins, the vegetation is dominated by alpine grasslands, meadows, and krummholz. Representative wildlife species in the Middle Rockies Ecoregion include big game species, yellow-bellied marmot, northern flying squirrel, Cooper's hawk, golden eagle, Stellar's jay, trumpeter swan, mountain bluebird, Clark's nutcracker, and boreal toad. High gradient perennial streams and rivers, and alpine lakes are found in the ecoregion.

3.2.18.3.1.2 Wyoming Basin

The Wyoming Basin Ecoregion is primarily located in central and western Wyoming with small areas in Montana, Colorado, Utah, and Idaho. It is mostly surrounded by mountainous ecoregions. The ecoregion has a dry, mid-latitude steppe and desert climate (Commission for Environmental Cooperation 2011). The terrain in the Wyoming Basin is a broad intermontane basin with portions of high hills and low mountains. The ecoregion is dominated by grasslands and shrublands. Some big game wildlife occurs in the Wyoming Basin with small mammals and raptors. The majority of the streams in the ecoregion are intermittent and ephemeral streams (Commission for Environmental Cooperation 2011).

3.2.18.3.2 GAP Vegetation Communities

Each primary GAP vegetation community is described in this section. These descriptions are adapted from NatureServe's Ecological System classification descriptions (NatureServe 2009) for the GAP land cover categories in each vegetation community. Descriptions of land cover categories in the Agriculture and Developed/Disturbed vegetation communities were adapted from the National Land Cover Dataset 2001 legend (Homer et al. 2007). Table 3-110 provides a summary of the vegetation communities crossed by each alternative route.

Table 3-110
Vegetation Resources Inventory Data

Alternative Route	Total Miles	Vegetation Communities (miles)					
		Barren/ Sparsely Vegetated[1]	Big Sagebrush	Developed/ Disturbed	Grassland	Limber pine-juniper	Shrub/Shrub Steppe
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant							
1A: Proposed Action	30.4	0.2	19.3	0.5	0.6	0.0	9.0
1A Variation: Dry Basin Draw	30.7	0.2	19.5	0.5	1.0	0.0	8.7
1B: Dry Piney	34.5	0.3	19.0	1.4	0.4	0.0	12.1
1C: Figure Four	38.5	0.3	16.6	1.9	0.4	0.0	18.3
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect							
2A: Proposed Action	129.1	3.4	60.1	0.2	0.3	0.0	63.8
2B: Southern Route	136.2	17.3	59.0	0.2	0.0	0.0	57.4
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect							
3A: Proposed Action	83.2	2.4	59.5	2.7	0.0	0.9	15.6
3B: Lost Creek to Lost Cabin	73.0	4.8	48.8	2.2	0.0	0.0	15.9
3C: Lost Creek to Highway 20/26	101.4	4.6	44.4	41.6	0.0	0.0	9.3

NOTE: [1]Barren/sparse vegetation is less than 10 percent cover.

3.2.18.3.2.1 Agriculture

This vegetation community is composed of the Cultivated Cropland GAP land cover category. Agriculture lands are considered those that are used to produce annual and perennial crops for human consumption, livestock grazing, or the production of seed or hay crops. This vegetation community is generally found in valley bottoms near rural and suburban areas.

3.2.18.3.2.2 Alpine

This vegetation community is composed of North American Alpine Ice Field, Rocky Mountain Alpine Turf, Rocky Mountain Alpine Fell-Field, and Rocky Mountain Alpine-Montane Wet Meadow GAP land

cover categories. These land cover categories are found at the highest elevations above tree line within mountain ranges. These sites are generally exposed to wind erosion and experience long-term or relatively permanent cover of snow and ice. Many areas are barren with high cover of rock and scree. Short growing seasons and extreme climatic conditions limit vegetation growth; plant species are generally dwarf or mat-forming forbs, graminoids, lichens, and shrubs.

3.2.18.3.2.3 Aspen

This vegetation community is composed of Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland, and Rocky Mountain Aspen Forest and Woodland GAP land cover categories. This vegetation community occurs in montane areas and is dominated by quaking aspen (*Populus tremuloides*) with less than 25 percent conifer species component. The distribution of this land cover type is limited by soil moisture and the growing season. Aspen woodlands are found across the western U.S. but are especially common in the mountains of the Colorado Plateau, Rocky Mountains, and the Great Basin. They occur on clay-rich, moist soils on mountain slopes. The shrubs, herbs and grasses found in aspen forests are very diverse. In some areas, quaking aspen forests are a mix of deciduous and coniferous trees, with one or more conifer species such as ponderosa pine, Douglas-fir, subalpine fir, Engelmann spruce, or lodgepole pine also occurring. This vegetation community originates and is maintained by stand-replacing disturbances, such as avalanches, crown fire, insect outbreak, windthrow, and vegetation management practices.

3.2.18.3.2.4 Barren and Sparsely Vegetated (less than 10 percent cover)

This vegetation community is composed of Inter-Mountain Basins Active and Stabilized Dune, Inter-Mountain Basins Cliff and Canyon, Inter-Mountain Basins Playa, Inter-Mountain Basins Shale Badland, Rocky Mountain Alpine Bedrock and Scree, Western Great Plains Badland, and Western Great Plains Cliff and Outcrop GAP land cover categories. This diverse group of land cover categories is generally described as having very low cover of vegetation and high cover of bare soil, rock outcrops, exposed bedrock, or sand. These land cover types are subject to erosion, low precipitation, saline or sodic soils, coarse-textured and shifting substrates, or other extreme abiotic conditions that create barriers to vegetation establishment. Sparse vegetation is often found only in crevices, rock cracks, and pockets in exposed rock where water and wind-blown soil accumulates.

3.2.18.3.2.5 Big Sagebrush

This vegetation community is composed of Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Big Sagebrush Steppe, and Inter-Mountain Basins Montane Sagebrush Steppe GAP land cover categories. The big sagebrush vegetation community occurs on well-drained, non-alkaline soils at middle elevations and is dominated by basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), Wyoming big sagebrush, and/or mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Typical co-dominant species include antelope bitterbrush, mountain snowberry (*Symphoricarpos oreophilus*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), and rubber rabbitbrush (*Ericameria nauseosa*). Big sagebrush occurs in valleys and foothills throughout the study corridors. Varied native bunchgrasses almost always occur when not displaced by cheatgrass (*Bromus tectorum*). Higher in the mountains, big sagebrush shrublands become very wildflower rich, and often occur in a matrix with montane and subalpine woodlands. In many areas, wildfires can maintain an open herbaceous-rich steppe condition.

3.2.18.3.2.6 Developed/Disturbed

This vegetation community is composed of Pasture/Hay; Developed, Medium, and Low Intensity; Developed, Open Space; and Harvest Forest – Grass/Forb Regeneration GAP land cover categories. These land cover types are modified either for human use (e.g., housing, parks, and commercial/ industrial developments), or through human activities (e.g., chaining, burning, or logging of vegetation; quarrying or mining of landscapes).

3.2.18.3.2.7 Grassland

This vegetation community is composed of Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland, Northern Rocky Mountain Subalpine-Upper Montane Grassland, Southern Rocky Mountain Subalpine Grassland, Northwestern Great Plains Mixedgrass Prairie, Western Great Plains Sand Prairie, and Recently Burned Grassland GAP land cover categories. Grasslands are found on a variety of landforms, generally in low precipitation zones. Distribution and vegetative composition of this vegetation community is generally influenced by livestock grazing and fire activity.

3.2.18.3.2.8 Montane Forest

This vegetation community is composed of Middle Rocky Mountain Montane Douglas-fir Forest and Woodland, Northern Rocky Mountain Foothill Conifer Wooded Steppe, Rocky Mountain Lodgepole Pine Forest, Rocky Mountain Poor-Site Lodgepole Pine Forest, Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland, Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland, Southern Rocky Mountain Subalpine Dry-Mesic Montane Mixed Conifer Forest and Woodland, and Harvested Forest – Northwestern Conifer Regeneration GAP land cover categories. These land cover categories exist in a wide range of aspects and moisture regimes. The species compositions in these land cover categories are diverse, but all are dominated by one or more coniferous tree species such as Douglas-fir, ponderosa pine, lodgepole pine, Engelmann spruce, or subalpine fir.

3.2.18.3.2.9 Mountain Shrub

This vegetation community is composed of Harvested Forest-Shrub Regeneration, Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland, Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland, Northern Rocky Mountain Montane-Foothill Deciduous Shrubland, Northern Rocky Mountain Subalpine Deciduous Shrubland, Rocky Mountain Lower Montane-Foothill Shrubland, and Rocky Mountain Alpine Dwarf-Shrubland GAP land cover categories. These land cover categories are dominated by woody shrub species such as curl-leaf mountain mahogany (*Cercocarpus ledifolius*), alderleaf mountain mahogany (*Cercocarpus montanus*), antelope bitterbrush, choke cherry (*Prunus virginiana*), ninebark (*Physocarpus* spp.), hawthorn (*Crataegus* spp.), mock orange (*Philadelphus* spp.), smooth sumac (*Rhus glabra*), serviceberry (*Amelanchier* spp.). These shrublands generally occur on rocky outcrops, steep slopes, and toe slopes with shallow, rocky soils that limit the establishment of forests and woodlands.

3.2.18.3.2.10 Limber Pine-Juniper

This vegetation community is composed of Rocky Mountain Foothill Limber Pine-Juniper Woodland GAP land cover category. Two-needle pinyon (*Pinus edulis*), singleleaf pinyon, and Utah juniper are the most common trees in these land cover categories. Understory and shrub species vary by region, but include black sagebrush, big sagebrush, green rabbitbrush, blackbrush, sagebrush, mountain mahogany, cliffrose (*Purshia* spp.), antelope bitterbrush, and Gambel oak.

3.2.18.3.2.11 Shrub Steppe

This vegetation community is composed of Inter-Mountain Basins Greasewood Flat, Inter-Mountain Basins Mat Saltbush Shrubland, Inter-Mountain Basins Mixed Salt Desert Scrub, and Wyoming Basins Dwarf Sagebrush Shrubland and Steppe GAP land cover categories. These land cover types generally occur in drier sites with shallow, rocky soils such as alluvial fans or hillslopes. Many shrub species occur in these land cover types, including blackbrush, Mormon tea (*Ephedra viridis*), spiny hopsage (*Grayia spinosa*), Bigelow sagebrush (*Artemisia bigelovii*), Wyoming big sagebrush, little sagebrush (*Artemisia arbuscula*), shadscale saltbush, jointfir, goldenbush (*Ericameria* spp.), Shockley's desert-thorn (*Lycium shockleyi*), bud sagebrush, greasewood, and horsebrush (*Tetradymia* spp.).

3.2.18.3.2.12 Open Water

This vegetation community is composed of the Open Water (Fresh) GAP land cover category and includes inland waters of streams, rivers, ponds and lakes. This category is all areas of open water with generally less than 25 percent cover of vegetation or soil.

3.2.18.4 Special Status Plant Species

The regulatory status and habitat descriptions for special status plant species that are known to occur in the study area are summarized in Table 3-111.

Table 3-111
Regulatory Status and Habitat of Special Status Plant Species in the Study Area

Species Common Name	Species Scientific Name	Regulatory Status	Habitat
Beaver Rim phlox	*Phlox pungens*	SS	Typically found in forests dominated by pines or in grasslands dominated by sagebrush (Innes 2010)
Cedar Rim thistle	*Cirsium aridum*	SS	Barren slopes on white-gray sandstone substrates, at 5,800 to 7,500 feet (Fertig 2000b)
Fremont County twinpod	*Physaria saximontana* var. *saximontana*	SS	Found along limestone, sandstone, or clay ridges and slopes of sparsely vegetated cushion plant communities of sagebrush and limber pines (Heidel 2014)
Large fruited bladderpod	*Lesquerella macrocarpa*	SS	Found on barren, low hills of fine-textured clay and shale type soils at 6,740 to 7,760 feet (Fertig and Heidel 2010)
Limber pine	*Pinus flexilis*	SS	In Wyoming, it grows typically on limestone and sandstone rich soils, may dominate windswept slopes or appear in forests with whitebark pines, lodgepole pines, and Douglas-firs (Steele et al. 1983)
Meadow milkvetch	*Astragalus diversifolius*	SS	Found in moist, salt-accumulating habitats, such as valleys, drainage areas, mounds, and shrub patches in vegetation that is sparse alkaline meadow and desert shrubs (Heidel 2009)
Owl Creek miners candle	*Cryptantha subcapitata*	SS	Typically found in sparsely vegetated plant communities on sandstone slopes and ridges (Fertig 2000c)
Persistent-sepal yellow-cress	*Rorippa calycina*	SS	Typically found along moist sandy or muddy banks of streams or stockponds near the high-water line (Fertig and Welp 1998).
Porter's sagebrush	*Artemisia porteri*	SS	Typically occurs in clay slopes of sparsely vegetated badlands of ashy or tufaceous mudstones at 5,300 to 6,500 feet. In the Wind River Basin, it is typically found in barren, desert shrub communities (Fertig 2000a)
Stemless beardtongue	*Penstemon acaulis*	SS	Found on sparsely vegetated rocky slopes and ridges (Jouseau 2012)
Trelease's racemose milkvetch	*Astragalus racemosus* var. *treleasei*	SS	Occurs mostly in sparsely vegetated outwash flats and fluted Badlands slopes of silty loams derived from shale at 6,500 to 7,500 feet (Heidel 2003)
Trufted twinpod	*Physaria condensata*	SS	Found on semi-barren slopes comprising calcareous shale and sandstone soils in vegetated cushion plant communities at 600 to 7,760 feet (Fertig 2002)
Ute ladies'-tresses	*Spiranthes diluvialis*	T	Typically found on alluvial sand and coarse silt soils of floodplains at elevations of 4,650 to 5,420 feet (Fertig 2000d)

Table 3-111 Regulatory Status and Habitat of Special Status Plant Species in the Study Area			
Species Common Name	**Species Scientific Name**	**Regulatory Status**	**Habitat**
Whitebark Pine	*Pinus albicaulis*	C	Typically found in cold and windy alpine and subalpine areas above 8,000 feet (USFWS 2015a)
NOTES: T = Federal USFWS Threatened Species C = Federal USFWS Candidate Species SS = BLM Sensitive Species			

Table 3-112 describes special status plants with known occurrences in each segment of the study area.

Table 3-112 Occurrence of Special Status Plant Species by Segment in the Study Area				
Species: Common Name	**Species: Scientific Name**	**Segment 1**	**Segment 2**	**Segment 3**
Beaver Rim phlox	*Phlox pungens*	✓	✓	
Cedar rim thistle	*Cirsium aridum*	✓	✓	
Fremont County twinpod	*Physaria saximontana* var. *saximontana*			✓
Large fruited bladderpod	*Lesquerella macrocarpa*	✓	✓	
Limber pine	*Pinus flexilis*		✓	✓
Meadow milkvetch	*Astragalus diversifolius*		✓	✓
Owl Creek miners candle	*Cryptantha subcapitata*			✓
Persistent-sepal yellow-cress	*Rorippa calycina*		✓	✓
Porter's sagebrush	*Artemisia porter*			✓
Stemless beardtongue	*Penstemon acaulis*		✓	
Trelease's racemose milkvetch	*Astragalus racemosus* var. *treleasei*	✓	✓	
Trufted twinpod	*Physaria condensate*	✓	✓	
Ute ladies'-tresses	*Spiranthes diluvialis*	✓	✓	✓
Whitebark pine	*Pinus albicaulis*	✓		

Two species of plants listed under the ESA are known to occur in the study area. Mapped potential habitat for the federally Threatened Ute ladies'-tresses (*Spiranthes diluvialis*) occurs in all three segments of the study area. Wetlands and wetter soils provide habitat for Ute ladies'-tresses. Also, habitat for the federal Candidate whitebark pine (*Pinus albicaulis*) occurs in Segment 1 of the study area. The whitebark pine is found in subalpine and alpine habitat above 8,000 feet in elevation. A third federally listed species, blowout penstemon (*Penstemon haydenii*), was previously suspected to occur in an area approximately 25 miles southeast of Big Piney in Sublette County. However, because of (1) the distance from USFWS-defined AOI and modeled-habitat for the species, (2) poor habitat quality in the study area, and (3) no documented occurrences in Sublette County (Fertig and Thurston 2003, Heidel 2012), blowout penstemon is not analyzed further in this EIS.

Modeled habitat for several of the species listed above is available from the Wyoming Natural Diversity Database (WYNDD). Miles of modeled habitat crossed by the Project alternative routes are summarized in Table 3-113. Modeled habitat data for two species, Trealease's racemose milkvetch (*Astragalus racemosus* var. *treleasei*) and Beaver Rim phlox (*Phlox pungens*), were not available and, therefore, not included in Table 3-113. In addition to the WYNDD modeled habitat, miles of the USFWS-defined AOI for Ute ladies'-tresses crossed by the Project alternative routes are included in Table 3-113.

Table 3-113
Special Status Plant Species Inventory Data

Alternative Route	Total Miles	Modeled habitat (miles)											
		Cedar Rim Thistle	Fremont County Twinpod	Large-fruited Bladderpod	Limber Pine	Meadow Milkvetch	Owl Creek Miners Candle	Persistent-sepal Yellowcress	Porter's Sagebrush	Stemless Beardtongue	Tufted Twinpod	Ute Ladies'-Tresses Area of Influence	Ute Ladies'-Tresses Modeled Habitat
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant													
1A: Proposed Action	30.4	0.6	0.0	6.8	0.0	0.0	0.0	0.0	0.0	0.0	0.8	9.2	0.0
1A Variation: Dry Basin Draw	30.7	0.6	0.0	6.8	0.0	0.0	0.0	0.0	0.0	0.0	0.6	9.2	0.0
1B: Dry Piney	34.5	0.6	0.0	6.8	0.0	0.0	0.0	0.0	0.0	0.0	0.6	8.2	0.0
1C: Figure Four	38.5	0.5	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.3	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect													
2A: Proposed Action	129.1	0.8	0.0	23.3	0.0	0.0	0.0	0.5	0.0	0.0	9.0	82.5	0.0
2B: Southern Route	136.2	0.0	0.0	6.8	0.0	0.0	0.0	0.5	0.0	0.0	1.4	105.2	0.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect													
3A: Proposed Action	83.2	0.6	0.6	0.0	0.1	0.0	0.0	0.2	5.6	0.0	0.0	82.3	0.6
3B: Lost Creek to Lost Cabin	73.0	0.6	0.0	0.0	0.0	0.0	1.3	0.4	14.3	0.0	0.0	72.7	0.6
3C: Lost Creek to Highway 20/26	101.4	0.6	0.0	0.0	0.0	0.0	1.3	0.9	10.2	0.0	0.0	101.1	0.6

3.2.18.5 Noxious Weeds and Invasive Plant Species

There are 26 noxious weed species listed by Sublette, Fremont, Lincoln, Sweetwater, and Natrona counties with the potential to occur in the study area, and 21 of these species are known to occur in the study area (Table 3-114).

Table 3-114
Known Occurrence of Noxious Weeds by Segment

Species: Common Name	Species: Scientific Name	Segment 1	Segment 2	Segment 3
Annual broomweed	*Gutierrezia draculoides*			✓
Balkan toadflax	*Linaria dalmatica*		✓	✓
Black henbane	*Hyoscyamus niger*	✓	✓	✓
Diffuse knapweed	*Centarurea diffusa*		✓	
Canada thistle	*Cirsium arvense*		✓	✓
Cheatgrass	*Bromus tectorum*	✓	✓	✓
Field bindweed	*Convolvulus arvensis*			✓
Leafy spurge	*Euphorbia esula*			✓
Musk thistle	*Carduus nutans*		✓	✓
Perennial pepperweed	*Lepidium latifolium*			✓
Puncturevine	*Tribulus terrestris*			✓
Russian knapweed	*Rhaponticum repens*		✓	✓
Russian olive	*Elaeagnus angustifolia*			✓
Saltcedar	*Tamarix* spp.			✓
Saltlover	*Halogeton glomeratus*	✓	✓	✓
Scotch thistle	*Onopordum acanthium*		✓	✓
Spotted knapweed	*Centaurea maculosa*		✓	✓
Swainsonpea	*Sphaerophysa salsula*			✓
Whitetop	*Lepidium draba*		✓	✓
Wild licorice	*Glycyrrhiza lepidota*		✓	✓
Yellowticks	*Helenium amarum*			✓

SOURCES: Fremont County n.d.; Natrona County n.d.

The high number of noxious weeds in Segment 3 of the study area can be attributed to the availability of more comprehensive data for Natrona County. Anecdotal information and other inventory data indicate most species listed by Natrona County are prevalent throughout Wyoming.

3.2.19 Visual Resources

3.2.19.1 Regulatory Framework

The following section describes the inventory of visual resources that may be affected by the Project. To provide context in which the VRI was developed, the following applicable BLM visual resource policies and regulations are discussed below

As per the FLPMA, the BLM is required to consider scenic values of public land as a resource that merits management and preservation, where appropriate, determined through the land-use planning process. In response to this direction, the BLM developed the *BLM Manual 8400 Series – Visual Resource Management* to: (1) inventory existing scenic values, (2) assign VRM management objectives to all lands administered by the BLM, and (3) describe visual design considerations that should be incorporated into all surface-disturbing activities.

Two specific BLM manuals were developed to address the above three items.

- *BLM Manual 8410-1 – Visual Resource Inventory* first focuses on developing an inventory of scenic values based on the following factors: (1) diversity of landscape features that define and characterize landscapes in each planning area (SQRU), (2) public concern for the landscapes that make up a planning area (SLRU), and (3) landscape visibility from public viewing locations (VDZ). These factors are collectively described as the VRI and are referred to as the VRI specifically for BLM-administered lands. Combined, these three factors determine VRI Classes, which indicate the existing scenic values of BLM-administered lands. Through the BLM's land-use planning process, as described in *BLM Manual 8410-1, Visual Resource Management Classes* (BLM 1986a) are established to provide management objectives in terms of allowable levels of disturbance (visual contrast; noticeability). The definitions from *BLM Manual 8410-1* of the four VRM class objectives are described in Table 3-115.

  Compliance with these objectives is assessed using *BLM Form 8400-4 – Visual Contrast Rating Worksheet*, as directed by *BLM Manual 8431 – Visual Resource Contrast Rating* (BLM 1986b), from selected KOPs which in addition to determining compliance with VRM Class objectives also include the identification of additional visual mitigation to further reduce visual contrast. *BLM Manual 8400* defines KOPs as, "one or a series of points on a travel route or at a use area or potential use area, where the view of a management activity would be most revealing" (Refer to Appendix B for KOP worksheets).

Table 3-115
Bureau of Land Management Visual Resource Management Classes

Visual Resource Management Class	Objective
Class I	Preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change [contrast] to the characteristic landscape should be very low and must not attract attention.
Class II	Retain the existing character of the landscape. The level of change [contrast] to the characteristic landscape should be low. Management activities may be seen but should not attract attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
Class III	Partially retain the existing character of the landscape. The level of change [contrast] to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
Class IV	Provide for management activities that require major modifications of the existing character of the landscape. The level of change [contrast] to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

SOURCE: BLM 1986a

- *BLM IM No. 98-164* provided additional guidance on the management of VRM. It stated that "(1) when VRM is addressed during the RMP process, and VRM management decision are made, the implementation of those decisions is mandated just as they are for any other resource allocation decisions. The implementation of those decisions is not at the discretion of the field manager, and (2) the current BLM VRM Manuals and Handbooks dictate how we conduct VRM business."

3.2.19.1.1 Specific Bureau of Land Management Field Office Visual Resource Direction

3.2.19.1.1.1 Casper Field Office Resource Management Plan

Management Goal

HR:5 Manage public lands in a manner that will maintain the overall scenic (visual) quality of these lands.

3.2.19.1.1.2 Pinedale Field Office Resource Management Plan

Management Goal

Manage public lands in accordance with VRM objectives. Minimize the impacts on visual resources.

Objective 1

Manage the public lands in a manner that protects the quality of the scenic values of those lands.

Actions

a. Projects of all types within established VRM class areas are required to conform to the objectives and characteristics of the VRM classification.

b. The BLM will work with project applicants to minimize project visual contrast regardless of VRM class.

c. VRM classifications will be managed according to Map 2-30 (Table 2-29 of Pinedale RMP): 21,290 acres will be managed as VRM Class I; 239,520 acres as VRM Class II; 419,410 acres as VRM Class III; and 242,660 acres as VRM Class IV.

h. All future development in the planning area would adhere to the VRM Management Class objectives established in the RMP. For example, VRM Class II objectives require that the existing character of the landscape be retained and that the level of change be low. To meet these objectives, the BLM expects that the level of development in VRM Management Class II would be very minimal. The BLM will utilize visual resource design techniques and BMPs to mitigate the potential visual impacts. Visual contrast ratings will be required for all major projects proposed for VRM Management Class I, II, and III areas, which have high sensitivity levels. In areas where VRM Management Class objectives cannot be met through design techniques and/or BMPs, the BLM has the authority to deny the project.

3.2.19.1.1.3 Rawlins Field Office Resource Management Plan

Management Goal

1. Manage public lands according to VRM classes that are determined based on land-use allocation decisions made in the Rawlins RMP.

Management Objectives

1. Establish VRM classes for the ARMPA.
2. Maintain the overall integrity of visual resource classes while allowing for development of existing and future uses.

Management Actions

1. Manage visual resources to meet the Wyoming Standards for Healthy Rangelands.
2. VRM classes are designated as shown on Map 2-50 (Table 2-9 and Appendix 25 of Rawlins Field Office RMP).

3.2.19.1.1.4 Rock Springs Field Office Resource Management Plan

Management Objectives

The objectives for management of visual resources are to: (1) maintain or improve scenic values and visual quality; and (2) establish priorities for managing the visual resources in conjunction with other resource values.

Management Actions

Visual resource classes will be retained or modified to enhance other resource objectives such as those for cultural resource and recreation management, wild horse viewing, and special management areas. The VRM classifications are shown on Table 14 and Map 24 (from Rock Springs RMP).

Projects and facilities will be designed to meet the objectives of the established visual classifications and appropriate mitigation will be included. Facilities (either in place or new), including linear rights-of-way, etc., must be screened, painted, or designed to blend with the surrounding landscape.

Management actions on public lands with a Class II VRM classification must be designed to blend into and retain the existing character of the natural landscape (Appendix 9-2 of Rock Springs RMP).

All surface-disturbing actions, regardless of the VRM class, are required to be mitigated to reduce visual impacts. This will be achieved by designing and locating the disturbances in a manner that most closely meets the minimum degree of contrast acceptable for the VRM class.

3.2.19.1.1.5 Lander Field Office

Management Goal

HR: 17. Maintain the overall scenic (visual) quality of BLM-administered lands.

Management Objectives

5066 HR: 17.1 AND HR: 17.2: Prohibit surface-disturbing activities within important scenic areas (VRM Classes I and II). Grant exceptions if it can be demonstrated through a visual simulation and contrast rating worksheet (from all KOPs within the area) that the project or identified mitigation will meet or exceed VRM Class I or II objectives. This restriction does not apply to temporary structures such as drilling rigs.

5069 HR: 17.1. AND HR: 17.2: Surface-disturbing activities within VRM Classes III and IV that cannot be seen from the Congressionally Designated Trails will be evaluated based on the VRM class designation at the site of the ground disturbance.

Surface-disturbing activities out of scale with the surrounding landscape that are within view of the Congressionally Designated Trails will be evaluated based on VRM Class II standards.

5070 HR: 17.1-17.3: All Proposed Actions within areas managed as VRM Class I, II, and III visual resources require a VRM contrast rating worksheet. On a case-by-case basis, determine if the project applicant would be required to utilize a visual simulation to test or show mitigation measures.

3.2.19.2 Regional Setting

The Project is in the Wyoming Basin and Middle Rocky Mountains physiographic provinces (Fenneman 1931). To provide a geographic context for the Project, below are summaries of the physiographic provinces crossed by the Project.

3.2.19.2.1 Wyoming Basin

The Wyoming Basin province is in south-central Wyoming and extends into northwest Colorado. All three segments of the Project cross part of this physiographic province.

The province is characterized by broad, arid intermontane basins interrupted by hills and low mountains. Topography is gently sloped in the basins, but becomes more dramatic and steep near local uplifts and surrounding mountains. Escarpments, found on surrounding hills and low mountains in the province, expose geologic layers, some of which are brightly colored. Hogback ridges and cuestas (long ridges with a steep escarpment on one side and gentle slope on the other) are additional distinctive landscape features found in this province.

In this arid, windswept landscape, basins and hills are dominated by grassland and shrubland species. Higher elevation hills include pinyon-juniper; in protected drainages at the highest elevations, vegetation includes isolated aspen and fir forests.

Though water is largely absent from the province, water is found in reservoirs, intermittent streams fed by snowmelt and summer storms, saline lakes and ponds that feature mudflats during wet years and salt pans in droughts, and several large rivers that occupy broad to narrow valleys.

The communities of Jeffrey, Casper, Farson, Eden, Pinedale, Big Piney and La Barge, Wyoming are in this physiographic province.

3.2.19.2.2 Middle Rocky Mountains

The Middle Rocky Mountain Province is located primarily in western Wyoming with portions extending into Montana, Idaho, Utah, and Colorado. Only a small portion of the Project visual study area, part of Segment 1, is in this physiographic province. The Wyoming Range is a mountain range that runs north-south, near the western edge of Wyoming, parallel to the Salt River Range to the west. The summits are red in color and have horizontal ridgelines, as well as steep cliffs, with lodgepole pines and aspens vegetation communities.

Vegetation in this province is largely dependent on elevations and alpine species occurring on the high peaks. The mosaic of these vegetation communities provides for a high level of landscape variety. Water is also an important feature of the Middle Rocky Mountains with the province including several major rivers and thousands of mountain lakes.

3.2.19.3 Visual Resources Affected

3.2.19.3.1 Scenery

Scenery is defined as a continuous unit of land comprising harmonizing features that result in and exhibit a particular character. These landscapes could be affected through the construction, operation, and maintenance of the Project including the modification of the landscapes' inherent character. The BLM field offices conducted their VRI in 2003 and 2011, to identify existing scenic values including the delineation of SQRUs and SLRUs (BLM 2003b, 2011c, and 2011d). The rating of SQRUs is based on the diversity of seven key factors: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications to assign a scenic quality rating (Class A [most diverse], Class B and Class C). SLRUs are

inventoried to define the level of concern the public would express toward the visible modification of a particular landscape. The BLM assigns either a high, medium, or low sensitivity level that relates to the level of public concern. When reviewed together, SQRUs and SLRUs identify a landscape's visual appeal as well as the public concern to modification of these landscapes.

3.2.19.3.2 Viewing Locations

Viewing locations represent places where the public would have potential views of the Project. These views could potentially be adversely modified through the introduction of the Project into their viewshed. In the development of the BLM VRI, VDZs are used to identify public viewing locations at a broad planning scale. Specifically, *BLM Manual 8410-1* describes VDZs as being run from travel routes or observation points to divide the landscape into three zones representing the relative visibility of different areas (foreground-middle ground [less than 5 miles], background [5 to 15 miles], and seldom seen [beyond 15 miles or not seen]). As described in *BLM Manual 8431,* KOPs are used to assess the level of change (contrast) introduced by a proposed project in a specified viewshed.

3.2.19.3.3 BLM Visual Resource Inventory

SQRUs are a measurement of the visual appeal of a tract of land and in the process of the VRI process; the lands are rated as A (a score of 19 or more), B (a score of 12 to 18), or C (a score of 11 or less). These rating units are based off apparent scenic quality determined by seven key factors each with their own scoring criteria: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications. Specific scoring criteria and descriptions can be found in the *BLM Manual 8410-1 Illustration 2.* Then, these factors are ranked in comparison to similar features in the physiographic province.

SLRUs are a measurement of public concern for the scenic quality. The rating for these units are classified as high, medium, and low sensitivity based on different factors such as: types of users, amount of use, public interest, adjacent land uses, special areas, and other factors that may be brought forth based on recent research findings and studies that include indication of visual sensitivity.

VDZs are the result of subdividing the landscape into three zones based on relative visibility from travel routes or observation points. The zones are categorized as foreground middleground, background, and seldom seen. Foreground/middleground is classified as the distance from the travel route or observation point for 3 to 5 miles. Background is the following zone seen from 5 to 15 miles, and seldom seen is the area that follows beyond the background zone.

VRI Classes, as described in *BLM Manual 8410,* are assigned through the BLM inventory process by combining the VRI components (i.e., SQRUs, SLRUs, and VDZs). The VRI Classes represent the inventoried scenic value of lands administered by the BLM which have comparable objective definitions as BLM VRM Classes with Class I and II, being the most valued, followed by Class III and Class IV. Note, VRI Classes do not represent BLM management direction for visual resources but instead represent existing scenic values.

3.2.19.3.4 Compliance with Federal Agency Management Objectives

As described in regulatory Framework, the BLM assigns VRM Classes through the land-use planning process to guide planning and project-level decisions. Compliance with the VRM Class objectives and conformance with the BLM field office RMPs is required by FLPMA. To determine compliance with the VRM Class objectives, a contrast analysis is conducted from KOP locations as directed by *BLM Manual 8431.*

3.2.19.4 Inventory Methodology

In response to the issues identified for analysis and in context with the Project's Regional Setting and Regulatory Framework, the following study methodology was developed with the BLM state and field office staff. The visual assessment will focus on four components: (1) impacts on scenery, (2) impacts on views, (3) impacts on the VRI, and (4) compliance with BLM VRM Classes and conformance with RMPs.

To develop the affected environment for the area potentially affected by the Project, the study area for visual resources was defined as the area within a 6-mile-wide corridor, centered on the reference centerline for each alternative route (i.e., 3-mile buffer). This distance will facilitate an assessment of a range of impacts levels from the Project as well as identify effective and practicable mitigation. To characterize existing visual values in this Project visual study area, the VRI completed for each BLM field office crossed by the Project alternative routes were compiled. These datasets included SQRUs, SLRUs, VDZs, and VRI Classes. Note, the Pinedale Field Office VRI does not contain VDZs or VRI Classes.

To define the affected environment for scenery, the SQRUs and associated SLRUs in the Project visual study area for each Project segment were identified to describe the visual appeal and public concern for modification of landscapes potentially affected by the Project. Note, the other components of the VRI will be reported in the VRI section of the affected environment.

To identify viewing locations potentially affected by the Project, as well as to determine compliance with BLM VRM Class objectives in accordance with BLM Manual 8431, a total of 12 KOPs were identified. Due to the importance of linear viewing locations in the Project area, including U.S. Highways, scenic backways, and National Trails (both NHTs, and NSTs), the majority of the KOPs for the Project are linear KOPs which include the entire portion of the associated alternative route in the Project visual study area. By assessing more than a single point along the alignment of these linear KOPs, the changing views experienced along the alternative routes can be described and assessed for impacts on views from these viewing locations. Static KOP locations are more appropriate for campgrounds, scenic overlooks, and other places where viewers would most likely experience a view from a particular location. Of these 12 Project-associated KOPs, 6 are associated with the visual resource assessment of impacts on views and the remaining 6 are associated with potential visual impacts on National Trails, described in Section 3.2.7. All 12 Project-associated KOPs were used to assess compliance with BLM VRM Class objectives due to the importance of National Trails to VRM in the BLM field offices crossed by the Project alternative routes. The Project-associated KOPs were identified through review of the BLM field office resource management plans, recreation and transportation data, BLM field office VRM Classes (in particular, areas where Project alternative routes cross VRM Class II lands), and through a workshop held with BLM VRM specialists on July 1, 2015. For each Project segment, the KOPs associated with visual resource study are listed in the affected environment including a description of the rationale for choosing these specific locations.

As described previously, SQRUs and associated SLRUs in the Project visual study area are reported in the scenery portion of the affected environment. To further describe and integrate the BLM VRI, the VRI portion of the affected environment lists, by Project segment, the following components in the Project visual study area, (1) SQRUs, (2) SLRUs, (3) VDZs, and (4) VRI Classes for each BLM field office located along the Project segment.

The final component of the visual resource affected environment, compliance with the BLM VRM and conformance with RMPs, contains two components, (1) BLM VRM Classes and (2) Project-associated KOP locations. The BLM VRM Classes from each BLM field office crossed by the Project alternative routes were compiled and the classes potentially crossed by each Project segment are listed by BLM field

office. In addition to the KOPs used as part of the assessment of impacts of views, the six National Trail KOPs are listed in the affected environment by Project segment.

3.2.19.5 Affected Environment

3.2.19.5.1 Scenery

As mentioned in the Regional Setting, the Project is in the Wyoming Basin and the Middle Rocky Mountains physiographic provinces with all three Project segments in Wyoming. The Project spans from western Wyoming to central Wyoming and crosses the Green River, the Big Sandy River, and the Sweetwater River through panoramic vistas of land with primarily sagebrush and other shrub communities. More detailed information on the affected environment regarding the specific Project segments is listed below.

3.2.19.5.1.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Surrounded by mountains and ridges such as Riley Ridge, Hogsback, and Cretaceous Mountain, this segment crosses through sagebrush covered basins crossed by multiple small valleys typical of the Wyoming Basin physiographic province. In addition to crossing through shrub steppe areas, this segment crosses through minimal grasslands areas. While the area crossed is mainly rural in character, crossing through the Dry Basin, with small canyons and mesas, in addition to crossing the Green River, with its associated riparian corridor, the area passes through industrialized sections. West of the Green River the cultural modifications crossed by the segment consist of petroleum production infrastructure and a network of roads. The Project could specifically influence the following SQRUs and associated SLRUs located in the Project visual study area (Table 3-116). Refer to Visual Resources MV-11.

Table 3-116
Bureau of Land Management Scenic Quality Rating Units and Sensitivity Level Rating Units Potentially Influenced by the Project in Segment 1

Scenic Quality Rating Unit		Associated Sensitivity Level Rating Unit(s)	
Name	**Class**	**Name**	**Level**
Pinedale Field Office			
Big Mesa	A	Big Mesa	Moderate
Wyoming Foothills	A	Wyoming Foothills	High
Deer Hills	B	Deer Hills	Moderate
Lower Green River	B	Lower Green River	Moderate
Lower Green River Cliffs	B	Lower Green River Cliffs	Moderate
Millstone Draw	B	Milestone Draw	Moderate
Piney Creek	B	Piney Creek	Moderate
N. La Barge	C	N. La Barge	Low
SE Desert	C	SE Desert	Low
Rock Springs Field Office			
La Barge Spur	A	Little Colorado Desert Town of La Barge	Moderate Moderate
Little Colorado Desert	C	Oregon-California-Mormon Pioneer-Pony Express Little Colorado Desert Lower Green River Town of La Barge	High Moderate Moderate Moderate
Sublette Flats	C	Oregon-California-Mormon Pioneer-Pony Express Sublette Flats	High Moderate

SOURCES: BLM 2011d, 2013i

3.2.19.5.1.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Like Segment 1, Segment 2 crosses through mostly rural landscapes that are vegetated with big sagebrush, shrub steppe areas and minimally crosses through wetland and riparian areas. This segment crosses the Jack Morrow Hills covered by a layer of sagebrush and black sagebrush with views of landscapes offered by the Packsaddle canyons, and the Cyclone Rim, with small creeks crossing the area such as Rock Cabin Creek. The segment runs between two mountains, the North Table Mountain and the Steamboat Mountain. In addition, the segment crosses recreational areas such as sand dunes, Boars Tusk recreation area, as well as crossing through the Alkali Basin and the Buffalo Hump Basin. While part of the segment follows an existing pipeline project, the segment also crosses a network of existing pipelines, two existing transmission lines, and oil and gas wells. The Project could specifically influence the following SQRUs, and associated SLRUs located in the Project visual study area (Table 3-117). Refer to Visual Resources MV-11.

Table 3-117
Bureau of Land Management Scenic Quality Rating Units and Sensitivity Level Rating Units Potentially Influenced by the Project in Segment 2

Scenic Quality Rating Unit		Associated Sensitivity Level Rating Unit(s)	
Name	**Class**	**Name**	**Level**
Lander Field Office			
Antelope Hills	B	Sensitive Observation Foreground/Middleground Picket Lake Stratton Draw	High Moderate Moderate
Crooks Mountain	B	Sensitive Observation Foreground/Middleground	High
Green Mountain	B	Sensitive Observation Foreground/Middleground	High
Crooks Gap	C	Sensitive Observation Foreground/Middleground	High
Pinedale Field Office			
Milleson Draw	B	Milleson Draw	Moderate
SE Desert	C	SE Desert	Low
Rawlins Field Office			
Luman Butte	C	Stratton Draw	Moderate
Stratton Draw	C	Picket Lake Stratton Draw	Moderate Moderate
Rock Springs Field Office			
Steamboat Mountain	A	Jack Morrow Hills Planning Area Steamboat Mountain Steamboat Mountain SMA	High High High
Big Sandy Recreation Area	B	Eden Valley Oregon-California-Mormon Pioneer-Pony Express Big Sandy River Wind River Front West	High High Moderate Moderate
Sand Dunes	B	Boars Tusk Greater Sand Dunes Jack Morrow Hills Planning Area Red Desert Watershed Sand Dunes WSA Steamboat Mountain Sand Dunes Point of Rocks-South Pass City Road Tri-Territory Loop	High High High High High High Moderate Moderate Moderate
Leucite Hills	B	Rock Springs Hills Tri-Territory Loop	Moderate Moderate

Table 3-117
Bureau of Land Management Scenic Quality Rating Units and Sensitivity Level Rating Units Potentially Influenced by the Project in Segment 2

Scenic Quality Rating Unit		Associated Sensitivity Level Rating Unit(s)	
Name	**Class**	**Name**	**Level**
Jack Morrow Hills	B	Jack Morrow Hills Planning Area	High
		Lander Road	High
		Oregon-California-Mormon Pioneer-Pony Express	High
		Red Desert Watershed	High
		Steamboat Mountain	High
		Steamboat Mountain SMA	High
Ten Mile Draw	B	Boars Tusk	High
		Greater Sand Dunes	High
		Indian Gap	High
		Jack Morrow Hills Planning Area	High
		Rock Springs Hills	Moderate
		Tri-Territory Loop	Moderate
		Cedar Canyon	Moderate
The Pinnacles	B	Alkali Draw	High
		Red Desert Watershed	High
White Mountain	B	Boars Tusk	High
		Jack Morrow Hills Planning Area	High
		White Mountain	Moderate
		Bryan-South Pass Stage Road	Moderate
Continental Divide	C	Greater Sand Dunes	High
		Jack Morrow Hills Planning Area	High
		Point of Rocks-South Pass City Road	Moderate
		Red Desert Basin	Moderate
		Tri-Territory Loop	Moderate
Dry Sandy Hills	C	Jack Morrow Hills Planning Area	High
		Oregon-California-Mormon Pioneer-Pony Express	High
		Little Sandy River	Moderate
		Bryan-South Pass Stage Road	Moderate
		Sublette Flats	Moderate
Great Divide Basin	C	Alkali Draw	High
		Jack Morrow Hills Planning Area	High
		Lander Road	High
		Green River Plains	High
		Red Desert Watershed	High
		South Pinnacles	High
		Steamboat Mountain SMA	High
		Point of Rocks-South Pass City Road	Moderate
		Tri-Territory Loop	Moderate
		Sand Dunes	Moderate
Green River Plains	C	Oregon-California-Mormon Pioneer-Pony Express	High
Little Colorado Desert	C	Oregon-California-Mormon Pioneer-Pony Express	High
		Little Colorado Desert	Moderate
Rock Springs Valley	C	Boars Tusk	High
		Greater Sand Dunes	High
		Jack Morrow Hills Planning Area	High
		Sand Dunes WSA	High

Table 3-117
Bureau of Land Management Scenic Quality Rating Units and Sensitivity Level Rating Units Potentially Influenced by the Project in Segment 2

Scenic Quality Rating Unit		Associated Sensitivity Level Rating Unit(s)	
Name	**Class**	**Name**	**Level**
Sublette Flats	C	Eden Valley	High
		Greater Sand Dunes	High
		Jack Morrow Hills Planning Area	High
		Oregon-California-Mormon Pioneer-Pony Express	High
		Sublette Flats	Moderate
		Bryan-South Pass Stage Road	Moderate
		Wind River Front West	Moderate

SOURCES: BLM 2011c, 2011d, 2012f, 2013i

3.2.19.5.1.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Segment 3 begins in between the Green Mountain Range and Crooks Peak, with vistas over the Sweetwater River of rock formations north of Jeffry City such as Grieve Ranch and Black Rock Gap. The landscapes in this area are typical of the Wyoming Basin physiographic province and are mostly associated with big sagebrush communities with portions of shrub steppe, grasslands, wetlands, and riparian vegetation communities crossed. This segment of the Project is in proximity to three mining operations as well as paralleling an existing pipeline, from Poison Spider Road, continuing to the east along this segment. The segment is also in proximity to oil and gas wells and is crossed by a several transmission lines in the northern end of the Project. The Project could specifically influence the following SQRUs, and associated SLRUs located in the Project visual study area (Table 3-118). Refer to Visual Resources MV-11.

Table 3-118
Bureau of Land Management Scenic Quality Rating Units and Sensitivity Level Rating Units Potentially Influenced by the Project in Segment 3

Scenic Quality Rating Unit		Associated Sensitivity Level Rating Unit(s)	
Name	**Class**	**Name**	**Level**
Casper Field Office			
Coalbank Hills	B	Unnamed SLRUs	High Moderate Low
Powder River Breaks	B	Unnamed SLRUs	High Moderate Low
Rattlesnakes	B	Unnamed SLRUs	High Moderate
Pine Mountain	C	Bridger Trail Highways Unnamed SLRUs	High Moderate Moderate Low
Western Natrona	C	Bridger Trail Highways Unnamed SLRUs	High Moderate Moderate Low

Table 3-118 Bureau of Land Management Scenic Quality Rating Units and Sensitivity Level Rating Units Potentially Influenced by the Project in Segment 3			
Scenic Quality Rating Unit		**Associated Sensitivity Level Rating Unit(s)**	
Name	**Class**	**Name**	**Level**
Lander Field Office			
Agate Flats	B	Agate Flats Sensitive Observation Foreground/Middleground	Moderate High
Beaver Rim	B	Agate Flats Beaver Rim	Moderate Moderate
Crooks Gap	B	Sensitive Observation Foreground/Middleground	High
Granite Mountains	B	Beaver Rim Sensitive Observation Foreground/Middleground	Moderate High
Green Mountains	B	Green Mountain Sensitive Observation Foreground/Middleground	Moderate High
Lysite Mountains	B	Copper Mountains	Moderate
Sweetwater Valley	B	Sensitive Observation Foreground/Middleground	High
Gas Hills	C	Moneta	Low
Moneta	C	Moneta	Low
Signor Ridge	C	Moneta	Low
Sweetwater Ridge	C	Sensitive Observation Foreground/Middleground	High
Badwater	C	Moneta	Low
SOURCES: BLM 2003b, 2012f			

3.2.19.6 Bureau of Land Management Visual Resource Inventory

3.2.19.6.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

3.2.19.6.1.1 Scenic Quality Rating Units:

The following SQRUs, by BLM field office, are in the Project visual study area:

Table 3-119 Bureau of Land Management Scenic Quality Rating Units Potentially Influenced by the Project in Segment 1	
Pinedale Field Office	
Name	**Class**
Wyoming Foothills	A
Piney Creek	B
Big Mesa	B
Deer Hills	B
Lower Green River	B
Lower Green River Cliffs	B
Milleson Draw	B
SE Desert	C
N. La Barge	C
Rock Springs Field Office	
La Barge Spur	A
Little Colorado Desert	C
Sublette Flats	C
SOURCES: BLM 2011d, 2013i	

3.2.19.6.1.2 Sensitivity Level Rating Units:

The following SLRUs, by BLM field office, are in the Project visual study area:

Table 3-120
Bureau of Land Management Sensitivity Level Rating Units
Potentially Influenced by the Project in Segment 1

Name	Level
Pinedale Field Office	
Wyoming Foothills	High
Piney Creek	Moderate
Big Mesa	Moderate
Deer Hills	Moderate
Lower Green River	Moderate
Lower Green River Cliffs	Moderate
Milleson Draw	Moderate
N. La Barge	Low
SE Desert	Low
Rock Springs Field Office	
Oregon-California-Mormon Pioneer-Pony Express	High
Little Colorado Desert	Moderate
Sublette Flats	Moderate
Town of La Barge	Moderate

SOURCES: BLM 2011d, 2013i

Visual Distance Zones:

Rock Springs Field Office: Foreground-middleground distance zone is in Project visual study area. Note, the Pinedale Field Office does not have VDZs as part of the VRI.

VRI Classes

Rock Springs Field Office: VRI Classes II, III, and VI are in Project visual study area. Note, the Pinedale Field Office does not have VRI Classes as part of the VRI.

3.2.19.6.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

3.2.19.6.2.1 Scenic Quality Rating Units:

The following SQRUs, by BLM field office, are in the Project visual study area:

Table 3-121
Bureau of Land Management Scenic Quality Rating Units
Potentially Influenced by the Project in Segment 2

Name	Class
Lander Field Office	
Antelope Hills	B
Crooks Mountain	B
Green Mountain	B
Crooks Gap	C
Pinedale Field Office	
Milleson Draw	B
SE Desert	C

Table 3-121 **Bureau of Land Management Scenic Quality Rating Units** **Potentially Influenced by the Project in Segment 2**	
Rawlins Field Office	
Luman Butte	C
Stratton Draw	C
Rock Springs Field Office	
Steamboat Mountain	A
Big Sandy Recreation Area	B
Jack Morrow Hills	B
Leucite Hills	B
Sand Dunes	B
Ten Mile Draw	B
The Pinnacles	B
White Mountain	B
Rock Springs Valley	C
Sublette Flats	C
Little Colorado Desert	C
Continental Divide	C
Dry Sandy Hills	C
Great Divide Basin	C
Green River Plains	C
SOURCES: BLM 2012f. Table 3-65, BLM Lander VRI Report. Wyoming. BLM 2013i. Pinedale Field Office Scenic Quality Inventory. Document number 5.F.12.2. Received by email June 25, 2015. BLM 2011c. Table 3-65, BLM Rawlins VRI Report. Wyoming. BLM 2011d. Table 3-65, BLM Rock Springs VRI Report. Wyoming.	

3.2.19.6.2.2 Sensitivity Level Rating Units:

Table 3-122 identifies the SLRUs, by BLM field office, located in the Project visual study area:

Table 3-122 **Bureau of Land Management Sensitivity Level Rating Units** **Potentially Influenced by the Project in Segment 2**	
Name	**Class**
Lander Field Office	
Sensitive Observation Foreground/Middleground	High
Picket Lake	Moderate
Pinedale Field Office	
Milleson Draw	Moderate
SE Desert	Low
Rawlins Field Office	
Stratton Draw	Moderate
Rock Springs Field Office	
Alkali Draw	High
Boars Tusk	High
Eden Valley	High
Greater Sand Dunes	High
Green River Plains	High
Indian Gap	High
Jack Morrow Hills Planning Area	High

Table 3-122 Bureau of Land Management Sensitivity Level Rating Units Potentially Influenced by the Project in Segment 2	
Name	**Class**
Lander Road	High
Oregon-California-Mormon Pioneer-Pony Express	High
Red Desert Watershed	High
Sand Dunes WSA	High
South Pinnacles	High
Steamboat Mountain	High
Steamboat Mountain SMA	High
White Mountain Rim	High
Big Sandy River	Moderate
Bryan-South Pass Stage Road	Moderate
Cedar Canyon	Moderate
Little Colorado Desert	Moderate
Little Sandy River	Moderate
Point of Rocks-South Pass City Road	Moderate
Red Desert Basin	Moderate
Rock Springs Hills	Moderate
Sand Dunes	Moderate
South Pass Hills	Moderate
Sublette Flats	Moderate
Tri-Territory Loop	Moderate
White Mountain	Moderate
Wind River Front West	Moderate
SOURCES: BLM. 2012f. Table 3-65, BLM Lander VRI Report. Wyoming. BLM 2013i. Pinedale Field Office Scenic Quality Inventory. Document number 5.F.12.2. Received by email June 25, 2015. BLM 2011c. Table 3-65, BLM Rock Springs VRI Report. Wyoming. BLM 2011d. Table 3-65, BLM Rawlins VRI Report. Wyoming.	

Visual Distance Zones

- Lander Field Office: Foreground-middleground, background, and seldom seen VDZs are in Project visual study area.
- Rawlins Field Office: Foreground-middleground distance zone is in Project visual study area.
- Rock Springs Field Office: Foreground-middleground distance zone is in Project visual study area.

VRI Classes

- Lander Field Office: VRI Classes, II, III, and VI are in Project visual study area.
- Rawlins Field Office: VRI Class, IV is in Project visual study area.
- Rock Springs Field Office: VRI Classes, II, III, and VI are in Project visual study area.

3.2.19.6.2.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Scenic Quality Rating Units

The following SQRUs, by BLM field office, are in the Project visual study area:

Table 3-123 **Bureau of Land Management Scenic Quality Rating Units** **Potentially Influenced by the Project in Segment 3**	
Name	**Class**
Casper Field Office	
Powder River Breaks	B
Rattlesnakes	B
Coalbank Hills	B
Pine Mountain	C
Western Natrona	C
Lander Field Office	
Agate Flats	B
Sweetwater Valley	B
Beaver Rim	B
Lysite Mountains	B
Crooks Mountain	B
Granite Mountains	B
Green Mountain	B
Gas Hills	C
Crooks Gap	C
Moneta	C
Badwater	C
Signor Ridge	C
Sweetwater Plains	C
SOURCES: BLM 2003b. Table 3-65, BLM Casper VRI Report. Wyoming. BLM 2012f. Table 3-65, BLM Lander VRI Report. Wyoming.	

Sensitivity Level Rating Units

The following SLRUs, by BLM field office, are in the Project visual study area:

Table 3-124 **Bureau of Land Management Sensitivity Level Rating Units** **Potentially Influenced by the Project in Segment 3**	
Name	**Class**
Casper Field Office	
Bridger Trail	High
Highways	Moderate
Unnamed SLRUs	High Moderate Low
Lander Field Office	
Sensitive Observation Foreground/Middleground	High
Agate Flats	Moderate
Beaver Rim	Moderate
Copper Mountain	Moderate
Green Mountain	Moderate
Moneta	Low
SOURCES: BLM 2003b. Table 3-65, BLM Casper VRI Report. Wyoming. BLM 2012f. Table 3-65, BLM Lander VRI Report. Wyoming.	

Visual Distance Zones

- Casper Field Office: Foreground-middleground and background VDZs are in Project visual study area.
- Lander Field Office: Foreground-middleground, background, and seldom seen VDZs are in Project visual study area.

VRI Classes

- Casper Field Office: VRI Classes II, III, and VI are in Project visual study area.
- Lander Field Office: VRI Classes II, III, and VI are in Project visual study area.

3.2.19.7 Viewing Locations

3.2.19.7.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

KOP P-2: Recreationists along the Green River (linear KOP) is associated with Segment 1 (Note: KOPs associated with National Trails are in Section 3.2.7). This KOP would have prolonged views of the Project, from the Green River, crossing BLM VRM Class II lands. Refer to MV-10.

3.2.19.7.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

KOPs associated with Project Segment 2 include:

- KOP RS-1: Motorists on the Red Desert Backcountry Byway (linear KOP) would have views of the Project, toward Alkali Draw WSA, paralleling this scenic road in BLM VRM Class II lands.
- KOP RS-2: Motorists on U.S. Highway 191 (linear KOP) would have views of the Project, from a major travel route, crossing BLM VRM Class III lands.
- KOP RS-3: Recreationists at the Boars Tusk would have views of the Project, from this recreational landmark, crossing BLM VRM Class II lands.

3.2.19.7.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

KOPs associated with Segment 3 include:

- KOP L-1: Motorists on U.S. Highway 287/NHT Auto Tour Route (Jeffrey City) (linear KOP) would have views of the Project, from this major travel route, crossing VRM Class III lands.
- KOP C-1: Motorists on U.S. Highway 20 (linear KOP) would have views of the Project, paralleling U.S. Highway 20, crossing BLM Class III lands.

3.2.19.8 Compliance with Federal Agency Visual Management Objectives

In addition to KOPs identified for assessment of impacts on views, the following KOPs from Section 3.2.7 have been included to identify compliance with the BLM VRM objectives. The KOPs are listed by segment as follows.

3.2.19.8.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

3.2.19.8.1.1 VRM Classes

Alternative routes in Segment 1 cross the following VRM classes:

- Pinedale Field Office: VRM Classes II, III, and IV
- Rock Springs Field Office: VRM Classes II and IV

3.2.19.8.1.2 Key Observation Points

For this segment and for compliance purposes, KOP P-1 North Piney Creek to Smith's Fork High Potential Route Segment (California NHT) was selected due to its association with NHT high potential route segments and views of BLM VRM Class II lands.

3.2.19.8.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

3.2.19.8.2.1 VRM Classes

Alternative routes in Segment 2 cross the following VRM classes:

- Lander Field Office: VRM Class III
- Rawlins Field Office: VRM Class III
- Rock Springs Field Office: VRM Classes II, III, and IV

3.2.19.8.2.2 Key Observation Points

For this segment, the following additional KOPs have been established for compliance purposes:

- KOP RS-4 NHT Auto Tour Route adjacent to Big Sandy to Green River High Potential Route Segment (California, Pony Express, Mormon Pioneer, and Oregon NHTs): This KOP was selected due to its association with NHT Auto Tour and proximity to high potential route segments and views of BLM VRM Class IV lands.
- KOP RS-5 Sublette Cutoff: This KOP was selected due to its association with the Sublette Cutoff (a component of the existing California NHT and under study by the NPS for possible addition to the Oregon NHT) and views of BLM VRM Class IV lands.
- KOP RS-6 South Pass High Potential Route Segment (California, Pony Express, Mormon Pioneer, and Oregon NHTs): This KOP was selected due to its association with NHT high potential route segments and views of BLM VRM Class IV lands.
- KOP L-3 CDNST: This KOP was selected due to its association with the CDNST and views of BLM VRM Class III lands.

3.2.19.8.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

3.2.19.8.3.1 VRM Classes

Alternative routes in Segment 1 cross the following VRM classes:

- Casper Field Office: VRM Classes II and III
- Lander Field Office: VRM Classes II, III, and IV

3.2.19.8.3.2 Key Observation Points

For this segment and compliance purposes, KOP L-2 South Pass (East) High Potential Route Segment (California, Pony Express, and Oregon NHTs) was selected due to its association with NHT high potential route segments and views of BLM VRM Class II lands.

3.2.20 Water Resources

This section addresses surface water and groundwater resources that may be affected by the Project.

3.2.20.1 Regulatory Framework

In addition to the relevant BLM land-use plans (refer to Section 1.6.2.1), water resources are subject to multiple supplemental statutes, regulations, plans, programs, and policies at the tribal, federal, state, and local government levels.

3.2.20.1.1 Federal

- Federal Executive Order 11988: Floodplain Management requires federal agencies to take action to avoid adverse impacts associated with the occupancy and modification of floodplains, as well as direct or indirect support of floodplain development.
- The objective of the CWA is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. The following sections of the CWA may influence construction and maintenance of the Project:
    - Section 301: Effluent Limitations from Point Sources and described in Section 303(d) of the CWA may affect the Project if a construction-related activity discharges a controlled pollutant such as sediment into regulated waters, which would require a permit with the NPDES.
    - Section 302: Water Quality Related Effluent Limitations is directly related to the NPDES Program. If the Project has the potential to add pollutants to a particular resource that is protected by a Total Maximum Daily Load (TMDL), it may be necessary to mitigate impacts and potentially require the Project to be included in the TMDL permit.
    - Section 303: Water Quality Standards and Implementation Plans, Designation of Impaired Waters states waters that potentially may be affected by the Project are subject to limitations set forth by the TMDL issued for the particular impaired water. If there is a high probability the Project will affect the impaired water, modification to the state construction general permit could be required. Section 303 of the CWA also falls under the NPDES Process.
    - Section 319: Effluent Limitations from Nonpoint Sources regulates the discharge of pollutants from various sources, which accumulate to reduce water quality standards set by the state. If the Project has the potential to add nonpoint source pollutants to a particular resource protected by a TMDL, it may be necessary to mitigate impacts and potentially may require the Project to be included into the TMDL Load permit.
    - Section 401: Water Quality Certification requires that an application for a federally permitted activity that may result in a discharge into a water of the U.S. must obtain this certification from the state with jurisdiction, certifying the action will not violate state or federal water quality standards.
    - Section 402: NPDES regulates water-quality standards specifically by issuing and monitoring construction-related permits for discharges into waters of the State.

  - Section 404: Dredge or Fill in waters of the U.S., including wetlands, regulates the dredging or filling of any material in a water of the U.S., including wetlands. If the Project requires the dredge or fill in a water of the U.S. as defined in 33 CFR Part 328.3 of the CWA, it may be necessary to obtain a general or individual permit to conduct the work. As a provision of the federal permitting process, mitigation for the permanent loss of jurisdictional wetlands or other waters of the U.S. may be required.

- Section 10 of Rivers and Harbors Appropriation Act of 1899. Section 10 regulates construction below the Ordinary High Water elevation of U.S. navigable waters, including tributaries and backwaters. A permit is required for dredge, fill, or other disturbance of soils/sediments below the Ordinary High Water of a navigable waterway. Work authorizations are provided under the same permitting process as Section 404 of the CWA.
- Safe Drinking Water Act. Under the Safe Drinking Water Act, the EPA sets standards for drinking water quality. It also oversees the states, localities, and water suppliers who implement those standards, but does not regulate private wells that serve fewer than 25 individuals. The Safe Drinking Water Act also mandates a Groundwater Wellhead Protection Program be developed by each state to protect groundwater resources that serve as sources for public drinking water.
- National Flood Insurance Program. In support of the National Flood Insurance Program, the FEMA identifies flood hazard areas throughout the U.S. This also includes Special Flood Hazard Areas, which are defined as areas of land that would be inundated by a flood having a 1 percent chance of occurring in any given year (previously referred to as the base flood or 100-year flood). Development may take place in Special Flood Hazard Areas, provided development complies with local floodplain management ordinances, which must meet the minimum federal requirements.
- Federal Anti-Degradation Policy. The EPA requires each state and Tribal Nation to develop, adopt, and retain a statewide anti-degradation policy regarding water quality standards and establish procedures for its implementation through the water quality management process. The state anti-degradation policy and implementation procedures must be consistent with the detailed three-tier management components of Sections 131.13(a)(1), 131.12(a)(2), and 131.12(a)(3) of 40 CFR 131.12.

3.2.20.1.2 State

- Wyoming has primacy from the EPA for implementing the NPDES to regulate the discharge of any pollutants from a point source into surface waters of the State. Through this program, operators of a point source discharge are required to receive coverage under a Wyoming Pollutant Discharge Elimination System (WYPDES) discharge permit.
- Wyoming Environmental Quality Act (Wyoming Statues 35-11-101 through 35-11-1904) sets regulations on surface and subsurface-disturbing activities to prevent, reduce, and eliminate pollution; to preserve and enhance the air and water, and reclaim the land of Wyoming; to plan the development, use, reclamation, preservation, and enhancement of the air, land, and water resources of the state; to preserve and exercise the primary responsibilities and rights of the state of Wyoming; to retain for the state the control over its air, land, and water and to secure cooperation between agencies of the state, agencies of other states, interstate agencies, and the federal government in carrying out these objectives.

3.2.20.2 Regional Setting

The Rocky Mountains located in western Wyoming provide the largest source of water for the Project area. Mountainous areas receive precipitation in the form of rainfall and snow, and surface water from

mountain precipitation collects in steep drainage features and contributes significantly to stream flow and groundwater recharge.

The study area includes four major river basins located in an arid to semi-arid region. The topography and variations in elevation make it difficult to divide the state into homogeneous, climatological areas. Precipitation across Wyoming is also variable based on elevation. For example, elevations between 6,500 and 8,500 feet receive 7 to 10 inches of precipitation annually. Lower elevations between 4,000 to 5,500 feet receive 12 to 16 inches annually. Because of this, water resources are driven by stored water throughout Wyoming. Segments 1 and 2 are in the Green River Basin. Segment 3 is in the Wind River Basin, Tongue-Powder River Basins, and North Platte River Basin.

3.2.20.2.1 Green River Basin

The Greater Green River Basin lies in the southwestern portion of Wyoming and encompasses about 21,047 square miles (13.4 million acres) (Wyoming Water Development Office 2010a). The river basin is bounded by the Gros Ventre Mountain Range to the north, the Wind River Mountains to the northeast, the Rawlins uplift to the east, and mountain ranges in the Overthrust Belt to the west. Elevations in the basin range from 6,000 feet to nearly 14,000 feet in the Wind River Range. Rainfall varies from 10 inches to 15 inches per year and yields about 50,000 acre-feet of precipitation per year of groundwater recharge approximately (Martin 1996; Glover et al. 1998; Wyoming Water Development Office 2010a).

3.2.20.2.2 Wind River Basin

The Wind River Basin covers an area from 65 miles west of Casper and extends west of Dubois and south to Lander, Wyoming (Wyoming Water Development Office 2010b). The Wind River Basin is bounded by the Wind River Mountain Range on the west and southwest, the Absaroka Range to the northwest, the Owl Creek Range to the north, and the Gas Hills to the east. The Wind River Range and a portion of the Absaroka Range constitute a portion of the Continental Divide. The Basin encompasses more than 8,500 square miles (5.44 million acres) and contains the headwaters for both the Wind and Bighorn Rivers.

Average precipitation for the Basin ranges from 5.46 inches to 9.97 inches annually (average 6.9 inches).

3.2.20.2.3 Powder/Tongue River Basin

The Powder/Tongue River Basin includes drainages of the Little Bighorn River, Tongue River, Powder River, and Little Powder River (Wyoming Water Development Office 2002). The Basin is bounded on the north by Montana and the Bighorn Mountains on the west. The Bighorn Mountains range in elevation from 8,000 feet to 10,000 feet and the lowest elevation in the basin is about 3,320 feet where the Little Powder River flows into Montana.

Annual precipitation across the basin ranges from 10 inches to over 30 inches in the mountain areas.

3.2.20.2.4 North Platte River Basin

The Platte River Basin encompasses nearly one-quarter of the land area of Wyoming and comprises the southeast portion of the state. All of Albany, Laramie, and Platte Counties and portions of Carbon, Converse, Fremont, Goshen, Natrona, Niobrara, Sublette, and Sweetwater Counties are in the basin (Wyoming Water Development Office 2006). Although portions of the drainages for both the North and South Platte Rivers exist in Wyoming, only the North Platte River flows through the state. The South Platte River drainage in Wyoming consists of headwater streams that drain into Colorado and Nebraska. The North Platte River drainage in Wyoming has been divided into the first six subbasins listed previously. One of the major tributaries of the North Platte is the Laramie River, which also headwaters in Colorado.

The greater Platte River Basin is in the Rocky Mountain, Wyoming Basin, and Great Plains Physiographic Provinces and encompasses a total area of approximately 23,907 square miles. The North Platte River Basin in Wyoming includes upstream portions of the North Platte River drainage basin and adjacent areas, which cover an area of approximately 21,907 square miles (14.02 million acres). Elevations in the basin range from 12,013 feet in the Medicine Bow Mountains to 4,025 feet where the river crosses the Wyoming-Nebraska state line. The North Platte River Basin is a snowmelt-driven system.

Precipitation in the basin ranges from 8 to 16 inches annually, and per the Wyoming Water Plan, the basin has a negative water balance due to the annual potential evapotranspiration that exceeds the mean annual precipitation.

3.2.20.3 Surface Water

Surface water resources in the study area include streams; rivers; waterbodies, such as lakes, ponds, and reservoirs; watersheds; and drainage basins. The potential impacts associated with surface water include the impacts on downstream receptors and water quality.

3.2.20.3.1 Watersheds and Drainage Systems

A watershed is defined as the geographic extent of the ground surface that contributes surface water runoff to a surface waterbody. Other names synonymous with watershed include "drainage basin" and "catchment." The watershed boundaries are determined by the location of topographic features that divide one drainage basin from the next. High elevation topographic features, such as ridges, hogbacks, or man-made structures, delineate watershed boundaries. The surface area that contributes to a watershed can also include tributary streams, lakes and reservoirs, and wetlands in the defined watershed. A contributing area encompasses all the surface waters, including tributary streams, waterbodies, and wetlands in the defined watershed. Major watersheds include multiple sub-watersheds that may include smaller sub-watersheds. Watershed acknowledgement is important for determining water quality, quantity, and geomorphology (USGS 2015a).

Watersheds are categorized using a tiered system that assigns a Hydrologic Unit Code (HUC) that is based on the relative size rating of the watershed. The HUC system is tiered, dividing and subdividing into progressively smaller hydrologic units based on surface features. Hydrologic units with 2 digits are regions (HUC 2), 4 digits are sub-regions (HUC 4), 6 digits are basins (HUC 6), 8 digits are subbasins (HUC 8), 10 digits are watersheds (HUC 10), and 12 digits are sub-watersheds (HUC 12). The hydrologic unit area progressively becomes smaller as the HUC number increases.

Most of the surface water in Wyoming is derived as flow from perennial streams originating in mountainous areas. The streams are fed by snowmelt, rainfall runoff, and groundwater discharge. Most of the water flowing through Wyoming originates in the state's borders. However, there are a few exceptions. The mountains in Colorado provide streamflow via the North Platte, Laramie, and Little Snake Rivers. The mountains in Montana provide streamflow via the Clarks Fork River. From Utah, the Blacks Fork, Henrys Fork, and Bear River provide streamflow (WWC Engineering et al. 2007).

Approximately 72 percent of the water in Wyoming drains north and east into the Missouri River Basin. 17 percent drains into Colorado River tributaries. 7 percent of the water is a combined drainage of the Bear River into the Great Salt Lake and the drainage of the Snake River into the Columbia River. 4 percent drains into the Great Divide Closed Basin (WWC Engineering et al. 2007).

3.2.20.3.1.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Segment 1 of the Project is in 1 region, sub-region, basin, and subbasin; 2 watersheds; and 10 sub-watersheds. The watersheds in Segment 1, as separated by HUC, are shown in Table 3-125.

Table 3-125
Hydrologic Units Located in Segment 1 of the Project Area

Hydrologic Unit Name (Code)	Name (Hydrologic Unit Code)	Alternative Route in the HUC area			
		1A: Proposed Action	1A Variation: Dry Basin	1B: Dry Piney	1C: Figure Four
Region (HUC 2)	Upper Colorado (14)	✓	✓	✓	✓
Subregion	Great Divide-Upper Green (1404)	✓	✓	✓	✓
Basin (HUC 6)	Upper Green (140401)	✓	✓	✓	✓
Subbasin (HUC 8)	Upper Green (14040101)	✓	✓	✓	✓
Watershed (HUC 10)	Green River-North Piney Creek (1404010109)	✓	✓	✓	✓
Subwatersheds (HUC 12)	*Lower South Piney Creek (140401010907)*	✓			
	Middle South Piney Creek (140401010908)	✓			
Watershed (HUC 10)	Green River-Birch Creek (1404010111)	✓	✓	✓	✓
Subwatersheds (HUC 12)	*Chapel Canyon (140401011106)*	✓		✓	✓
	Chappell Creek-Green River (140401011110)				✓
	Birch Creek (140401011109)				✓
	Bird Draw-Green River (140401011108)	✓	✓	✓	✓
	Dry Basin Draw (140401011101)	✓	✓	✓	✓
	Dry Piney Creek (140401011103)	✓		✓	✓
	North Fork Dry Piney Creek (140401011102)			✓	✓
	Figure Four Canyon (140401011107)	✓	✓		✓

3.2.20.3.1.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Segment 2 watershed units include 2 regions and sub-regions; 3 basins; 6 subbasins; 18 watersheds; and 46 sub-watersheds (Table 3-126). Two regions, the Missouri and Upper Colorado, are crossed by Segment 2. In particular, this segment also crosses the northwest portion of an internal drainage area known as the Great Divide Basin. The Great Divide Basin is a closed basin encompassing approximately 3,500 square miles of land located in the larger Greater Green River Basin (HUC-4). The continental divide surrounds the Great Divide Basin, which causes surface water that falls as precipitation in the basin to flow to an internal geographic area commonly known as the Red Desert. The elevation in the basin ranges from 6,647 feet above mean sea level near the center of the basin to over 8,000 in the highlands. Alternative 2A: Proposed Action enters the northwest corner of the basin near Bush Rim and The Pinnacles before trending to the northeast across Buffalo Jump Basin and exiting near the north-central portion of the Great Divide Basin just across Fremont County border. Alternative 2B: Southern Route enters the western boundary of the basin near North Table Mountain and South Table Mountain before traversing the Alkali Basin. The general area of interest along Segment 2 and in the Great Divide Basin is known as the Red Desert and will be referred as such in the remainder of this document.

The availability and occurrence of surface water sources can change depending on the season and climatic conditions during any year. The water source availability depends on whether Alternative 2A: Proposed Action or Alternative 2B: Southern Route will be selected as the Preferred Alternative. After selecting a preferred alternative route, a water source(s) will be identified by the owner and proper permission(s) for water use will be obtained through Wyoming Water Rights permitting process prior to beginning construction.

Table 3-126 includes two regions that divide the sub-regions, basins, subbasins, watersheds, and sub-watersheds associated with each region.

Table 3-126
Hydrologic Units Located in Segment 2 of the Project Area

Hydrologic Unit Name (Code)	Name (Hydrologic Unit Code)	Alternative Route in the HUC area	
		2A: Proposed Action	2B: Southern Route
Region (HUC2)	Missouri (10)	✓	✓
Subregion	North Platte (1018)	✓	✓
Basin (HUC 6)	North Platte (101800)	✓	✓
Subbasin (HUC 8)	Sweetwater (10180006)	✓	✓
Watershed (HUC 10)	Crooks Creek-Sweetwater River (1018000606)	✓	✓
Subwatersheds (HUC 12)	*Upper Crooks Creek (101800060601)*	✓	✓
	Middle Crooks Cree (101800060601)	✓	✓
Region (HUC2)	Upper Colorado (14)	✓	✓
Subregion	Great Divide-Upper Green (1404)	✓	✓
Basin (HUC 6)	Great Divide Closed Basin (140402)[1]	✓	✓
	Upper Green (140401)	✓	✓
Subbasin (HUC 8)	Big Sandy (14040104)	✓	✓
	Bitter (14040105)		✓
	Great Divide Closed Basin (14040200)[1]	✓	✓
	Sweetwater (10180006)	✓	✓
	Upper Green (14040101)	✓	✓
	Upper Green-Slate (14040103)	✓	✓
Watershed (HUC 10)	Alkali Basin (1404020011)[1]	✓	✓
Subwatersheds (HUC 12)	*Alkali Draw (140402001101)*	✓	
	Alkali Well-Alkali Basin (140402001104)	✓	✓
	Buffalo Hump Lake (140402001102)	✓	✓
	Fourth of July Wash (140402001102)		✓
Watershed (HUC 10)	Birch Creek Green River (1404010111)	✓	✓
Subwatersheds (HUC 12)	*Chapel Canyon (140401011106)*	✓	✓
Watershed (HUC 10)	Black Rock Creek (1404020010)		✓
Subwatersheds (HUC 12)	*Greasewood Wash (140402001002)*		✓
Watershed (HUC 10)	Bone Draw (1404010405)		✓
Subwatersheds (HUC 12)	*Bone Draw (140401040503)*		✓
	Sixmile Draw (140401040501)		✓
Watershed (HUC 10)	Buckhorn Canyon (1404010302)	✓	✓
Subwatersheds (HUC 12)	*Upper Buckhorn Canyon (140401030201)*	✓	✓

Table 3-126
Hydrologic Units Located in Segment 2 of the Project Area

Hydrologic Unit Name (Code)	Name (Hydrologic Unit Code)	Alternative Route in the HUC area	
		2A: Proposed Action	2B: Southern Route
Watershed (HUC 10)	Bush Creek (1404020012)	✓	✓
Subwatersheds (HUC 12)	*Lower Bear Creek (140402001204)*	✓	✓
	Lower Bush Creek (140402001205)	✓	✓
	Upper Bush Creek (140402001201)	✓	
Watershed (HUC 10)	Cyclone Draw (1404020014)[1]	✓	✓
Subwatersheds (HUC 12)	*Stratton Lakes-Cylone Draw (140402001401)*	✓	✓
Watershed (HUC 10)	Eighteenmile Canyon (1404010303)	✓	✓
Subwatersheds (HUC 12)	*Lombard Canyon (140401030304)*		✓
	Lower West Buckhorn Draw (140401030303)		✓
	Middle Eighteenmile Gulch (140401030305)		✓
	Twelvemile Sink (140401030306)		✓
	Upper Eighteenmile Canyon (140401030301)	✓	
	Upper West Buckhorn Draw (140401030302)	✓	✓
Watershed (HUC 10)	Killpecker Creek (1404010507)		✓
Subwatersheds (HUC 12)	*Boars Tusk-Killpecker Creek (140401050702)*		✓
	Nitch Creek (140401050701)		✓
Watershed (HUC 10)	Little Sandy Creek (1404010403)	✓	
Subwatersheds (HUC 12)	*Lower Dry Sandy Creek (140401040305)*	✓	
	Lower Little Sandy Creek (140401040306)	✓	
Watershed (HUC 10)	Lost Creek (1404020001)[1]	✓	✓
Subwatersheds (HUC 12)	*Arapahoe Creek (140402000102)*	✓	✓
	Lower Lost Creek (140402000104)	✓	✓
	Upper Lost Creek (140402000101)	✓	✓
Watershed (HUC 10)	Lower Big Sandy River (1404010406)	✓	✓
Subwatersheds (HUC 12)	*(140401040603)*		✓
	Big Bend-Big Sandy River (140401040607)		✓
	Carlson Draw-Big Sandy River (140401040606)		✓
	Eden Reservoir-Big Sandy River (140401040601)	✓	
	Stagecoach Draw (140401040604)		✓
Watershed (HUC 10)	Pacific Creek (1404010402)	✓	
Subwatersheds (HUC 12)	*Alkali Creek (140401040201)*	✓	
	Lower Jack Morrow Creek (140401040205)	✓	
	Lower Pacific Creek (140401040207)	✓	
	Middle Pacific Creek (140401040206)	✓	
	Rock Cabin Creek (140401040203)	✓	
Watershed (HUC 10)	Red Creek (1404020013)	✓	✓
Subwatersheds (HUC 12)	*(140402001303)*	✓	✓
	Bastard Butte Red Creek (140402001304)	✓	✓
Watershed (HUC 10)	Sublettes Flat (1404010404)[1]	✓	
Subwatersheds (HUC 12)	*Jonah Gulch (140401040401)*	✓	
	Haystack Butte Sublettes Flat (140401040405)	✓	
	Teakettle Butte (140401040402)	✓	

Table 3-126 Hydrologic Units Located in Segment 2 of the Project Area			
Hydrologic Unit Name (Code)	**Name (Hydrologic Unit Code)**	**Alternative Route in the HUC area**	
		2A: Proposed Action	**2B: Southern Route**
Watershed (HUC 10)	Upper Big Sandy River (1404010401)	✓	
Subwatersheds (HUC 12)	*(140401040110)*	✓	
	Big Sandy Reservoir-Big Sandy River (140401040112)	✓	
	Little Sandy Reservoir Number 2 (140401040111)	✓	
NOTE: [1]Indicates a closed basin, a drainage area where all surface flow is internal.			

3.2.20.3.1.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Segment 3 is in 1 region, 3 sub-regions, 3 basins, 6 subbasins, 1 watershed, and 28 sub-watersheds (Table 3-127).

Table 3-127 Hydrologic Units Located in Segment 3 of the Project Area				
Hydrologic Unit Name (Code)	**Name (Hydrologic Unit Code)**	**Alternative Route in the HUC area**		
		3A: Proposed Action	**3B: Lost Creek to Lost Cabin**	**3C: Lost Creek to Highway 20/26**
Region (HUC2)	Missouri (10)	✓	✓	✓
Subregion	Big Horn (1008)	✓	✓	✓
	North Platte (1018)	✓	✓	✓
	Powder-Tongue (1009)	✓		✓
Basin (HUC 6)	Big Horn (100800)	✓	✓	✓
	North Platte (101800)	✓	✓	✓
	Powder (100902)	✓		✓
Subbasin (HUC 8)	Badwater (10080006)		✓	
	Lower Wind (10080005)	✓	✓	✓
	Middle North Platte-Casper	✓		✓
	Muskrat (10080004)	✓	✓	✓
	South Fork Powder (10090203)	✓		✓
	Sweetwater (10180006)	✓	✓	✓
Watershed (HUC 10)	Alkali Creek (1008000601)		✓	
Subwatersheds (HUC 12)	*Reservoir Creek-Alkali Creek (100800060106)*		✓	
Watershed (HUC 10)	Buffalo Creek-Sweetwater River (1018000605)	✓	✓	
Subwatersheds (HUC 12)	*Buffalo Creek (101800060504)*	✓	✓	✓
	O'Brien Creek-Sweetwater River (10180060505)	✓	✓	

Table 3-127
Hydrologic Units Located in Segment 3 of the Project Area

Hydrologic Unit Name (Code)	Name (Hydrologic Unit Code)	Alternative Route in the HUC area		
		3A: Proposed Action	3B: Lost Creek to Lost Cabin	3C: Lost Creek to Highway 20/26
Watershed (HUC 10)	Crooks Creek-Sweetwater River (1018000605)	✓	✓	✓
Subwatersheds (HUC 12)	*Lower Crooks Creek (101800060603)*	✓		✓
	Middle Crooks Creek (101800060602)	✓		✓
	Lower Diamond Springs Draw (101800060605)	✓	✓	✓
	Soda Lakes-Sweetwater River (101800060606)	✓	✓	✓
Watershed (HUC 10)	Lower Poison Creek (1008000503)		✓	✓
Subwatersheds (HUC 12)	*Graham Reservoir-Poison Creek (100800050302)*		✓	
Watershed (HUC 10)	Middle Fork Casper Creek (1018000704)	✓		✓
Subwatersheds (HUC 12)	*Burke Reservoir (101800070403)*[1]	✓		✓
	Coyote Creek (100800070402)	✓		
	Middle Fork Casper Creek (101800070404)	✓		
	Upper Middle Fork Casper Creek (101800070401)	✓		
Watershed (HUC 10)	South Fork Casper Creek (1018000705)	✓		
Subwatersheds (HUC 12)	*Upper South Fork Casper Creek (101800070501)*	✓		
Watershed (HUC 10)	Upper Badwater Creek (1008000603)		✓	
Subwatersheds (HUC 12)	*Sand Creek (100800060304)*		✓	
	South Fork Badwater Creek-Badwater Creek (100800060305)		✓	
Watershed (HUC 10)	Upper Muskrat Creek (1008000402)	✓	✓	✓
Subwatersheds (HUC 12)	*Coyote Creek-Muskrat Creek (100800040201)*	✓	✓	✓
	Fraser Draw (100800040202)	✓	✓	✓
	Indian Grove Creek-Muskrat Creek (10800040203)	✓	✓	✓
	Mahoney Reservoir-Muskrat Creek (100800040204)		✓	✓
Watershed (HUC 10)	Upper Poison Creek (1008000502)	✓	✓	✓
Subwatersheds (HUC 12)	*Frenchie Reservoir-Poison Creek (100800050208)*			✓
	Garrison Reservoir-Poison Creek (100800050202)			✓
	Hiland Reservoir-Poison Creek (100800050201)			✓
	Lower Deer Creek (100800050207)		✓	✓
	Upper Canyon Creek (100800050204)	✓		
	Upper Deer Creek (100800050203)	✓		
Watershed (HUC 10)	Wallace Creek-South Fork Powder River (1009020301)	✓		✓
Subwatersheds (HUC 12)	*Fales Creek (100902030103)*	✓		
	Lower Wallace Creek (100902030105)	✓		
	Powder River Draw-South Fork Powder River (100902030107)			✓
	Sand Draw (100902030101)			✓
	Upper Wallace Creek (100902030104)	✓		

NOTE: [1]Indicates a closed basin, a drainage area where all surface flow is internal.

3.2.20.3.2 Streams, Rivers, and Waterbodies

Streams and rivers (lotic waters) are primarily characterized as having flowing water in a state of continual physical change due to Earth's gravitational pull (USGS 2015b). Streams are classified based on their usual level of flow as perennial, intermittent, or ephemeral. Perennial streams have a constant base flow throughout the year, except during times of severe drought, and are often fed by multiple water sources. Intermittent streams flow for a portion of the year, typically during peak snowmelt and/or precipitation seasons. Ephemeral streams only flow immediately after a snowmelt or rain fall. The occurrence of each type of stream varies greatly throughout the Project area, mainly due to differences in terrain, aspect, geology, and precipitation specific to the drainage areas from which they originate. At a finer scale, streams and rivers exhibit a high degree of microhabitats that allow for complex ecosystems of plants, animals, and micro-organisms, as well as physical and chemical processes. The WGFD classifies streams that provide excellent habitat for complex ecosystems as Crucial Streams. These streams are considered crucial for providing fauna (animals) with reliable, quality habitat for breeding and spawning purposes.

There are four major classes of surface water in Wyoming. These include:

- Class 1: Outstanding Waters
- Class 2: Fisheries and Drinking Water
- Class 3: Aquatic Life Other than Fish
- Class 4: Agriculture, Industry, Recreation, and Wildlife

Definitions of Class are provided in Water Quality Rules and Regulations – Chapter 1, Wyoming Surface Water Quality Standards (EPA 2007).

Waterbodies (lentic waters) are characterized as having standing or relatively still water contained in a closed or semi-closed impoundment. Waterbodies in the Project area include lakes, reservoirs, and ponds are categorized using the Cowardin system (Cowardin et al. 1979), lacustrine deepwater habitat codes. Waterbodies are highly variable throughout the Project; many are man-made, serving the purpose of storing water for municipal and agricultural uses and controlling floods. The capture and retention of surface water represents a major source of water for consumptive use in Wyoming. Constructed reservoirs can provide a major source of water in the Project area. The following sections identify the number of mapped lotic waters present in each segment. It should be noted that although numerous lotic waters are present in the Project area, the number of pipeline crossings across waters are significantly fewer.

Lotic waters were identified within a 1-mile radius (2-mile area along the pipeline) using the information contained in the National Hydrography Dataset. The radius was selected to allow relative comparisons between each alternative route for the number of waterbodies located along the pipeline. Although mapped ephemeral waters were not identified in the USGS' National Hydrography Dataset, numerous unmapped ephemeral waters exist along alternative pipeline routes. Due to the potentially large number of ephemeral stream crossings, the final number of waters crossed by the pipeline and their locations will be provided in the EIS after the Preferred Alternative is selected.

3.2.20.3.2.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Within the 2-mile study area along Alternative 1A: Proposed Action, 229 mapped lotic waters are present, including:

- 13 perennial waters
- 176 intermittent waters

- No mapped ephemeral waters identified
- 40 canals, connectors or artificial paths

Within the 2-mile study area along Alternative 1A Variation: Dry Basin Draw, 68 mapped lotic waters are present, including:

- No mapped perennial waters
- 53 intermittent waters
- No mapped ephemeral waters identified.
- 15 canals, connectors or artificial paths

Within the 2-mile study area along Alternative 1B: Dry Piney, 309 mapped lotic waters are present, including:

- 45 perennial waters
- 204 intermittent waters
- No mapped ephemeral waters identified.
- 60 canals, connectors or artificial paths

Within the 2-mile study area along Alternative 1C: Lost Creek to Highway 20/26, 316 mapped lotic waters are present, including:

- 38 perennial waters
- 224 intermittent waters
- No mapped ephemeral waters identified.
- 54 canals, connectors or artificial paths

Table 3-128 summarizes the named lotic waters located in Segment 1.

Table 3-128
Named Lotic Waters Located in Segment 1 of the Project Area

Type	Lotic Water Name
Perennial	Beaver Creek Dry Piney Creek Fish Creek Fogarty Creek Green River Middle Piney Creek North Fork Dry Piney Creek South Piney Creek Spring Creek
Intermittent	Birch Creek Dry Piney Creek Middle Piney Creek North Fork Dry Piney Creek

A total of 35 lentic waters are also located in Segment 1, all unnamed per the USGS: National Hydrography Dataset. Segment 1 lentic waters include 25 unnamed intermittent lakes/ponds, 9 unnamed perennial lakes/ponds, and 1 swamp/marsh is in Segment 1.

3.2.20.3.2.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Within the 2-mile study area along Alternative 2A: Proposed Action, 938 mapped lotic waters are present, including:

- 74 perennial waters
- 797 intermittent waters
- No mapped ephemeral waters identified
- 67 canals, connectors or artificial paths

Within the 2-mile study area along Alternative 2B: Southern Route, 774 mapped lotic waters are present, including:

- 51 perennial waters
- 675 intermittent waters
- No mapped ephemeral waters identified.
- 48 canals, connectors or artificial paths

Table 3-129 summarizes the named Segment 2 lotic waters.

Table 3-129
Named Lotic Waters Located in Segment 2 of the Project Area

Type	Lotic Water Name
Perennial	Bear Creek Bush Creek Crooks Creek Little Sandy Creek Lost Creek North Pacific Creek Pacific Creek Red Creek Red Cabin Creek
Intermittent	Alkali Creek Arapahoe Creek Arapahoe Ditch Bare Ring Slough Bear Creek Bush Creek Cut Creek Dry Sandy Creek Jack Morrow Creek Jack Parnell Creek Killpecker Creek Lost Creek Nitch Creek North Pacific Creek Pacific Creek West Fork Crooks Creek

Segment 2 also includes 123 named and unnamed lentic waters per the USGS: National Hydrology Dataset. Segment 2 lentic waters include 85 intermittent lakes/ponds (3 named and 82 unnamed), 33 perennial lakes/ponds (2 named and 31 unnamed), 5 swamps/marshes (no named and 5 unnamed), and no reservoirs. Table 3-130 summarizes the named Segment 2 lentic waters. Streams listed in Table 3-129 as

intermittent could be considered seasonally interrupted waterbodies. Although ephemeral waters exist in the segment, no data are available to identify the number of ephemeral waters potentially occurring in Segment 2.

There are no BLM water resource-related management areas in Segment 2.

Table 3-130
Named Lentic Waters Located in Segment 2 of the Project Area

Type		Lentic Water Name
Lakes/Ponds	Perennial	Cold Spring Reservoir Stratton Lakes
	Intermittent	Baby Antelope Reservoir Carson Lakes Hadsell Reservoir

3.2.20.3.2.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Within the 2-mile study area along Alternative 3A: Proposed Action, 447 mapped lotic waters are present, including:

- 32 perennial waters
- 337 intermittent waters
- No mapped ephemeral waters identified
- 78 canals, connectors or artificial paths

Within the 2-mile study area along Alternative 3B: Lost Creek to Lost Cabin, 315 mapped lotic waters are present, including:

- 9 perennial waters
- 236 intermittent waters
- No mapped ephemeral waters identified
- 70 canals, connectors or artificial paths

Within the 2-mile study area along Alternative 3C: Lost Creek to Highway 20/26, 483 mapped lotic waters are present, including:

- 6 perennial waters
- 382 intermittent waters
- No mapped ephemeral waters identified.
- 95 canals, connectors or artificial paths

Table 3-131 summarizes the named Segment 3 lotic waters.

Table 3-131
Named Lotic Waters Located in Segment 3 of the Project Area

Type	Lotic Water Names	
Perennial	Badwater Creek	Landon Creek
	Cow Camp Creek	Middle Fork Casper Creek
	Crooks Creek	Stone Cabin Creek
	Deer Creek	Wallace Creek
	Fales Creek	

Table 3-131 Named Lotic Waters Located in Segment 3 of the Project Area		
Type	**Lotic Water Names**	
Intermittent	Alkali Creek	Muskrat Creek
	Cow Camp Creek	Poison Creek
	Coyote Creek	Reservoir Creek
	Crooks Creek	South Fork Badwater Creek
	Deer Creek	South Fork Casper Creek
	Dry Coyote Creek	South Fork Casper River
	East Canyon Creek	South Fork Sand Creek
	Mason Creek	Spring Creek
	Middle Fork Casper Creek	West Canyon Creek

Segment 3 also includes 217 named and unnamed lentic waters per the USGS National Hydrology Dataset. Segment 2 lentic waters include 42 perennial lakes/ponds (4 named and 38 unnamed), 167 intermittent lakes/ponds (7 named and 160 unnamed), 3 reservoirs (1 named and 2 unnamed), and 5 swamps/marshes (1 named and 4 unnamed) as shown in Table 3-132. Streams listed in Table 3-132 as intermittent could be considered seasonally interrupted waterbodies. Although ephemeral waters exist in the segment, no data are available to identify the number of ephemeral waters potentially occurring in Segment 3.

Table 3-132 Named Lentic Waters Located in Segment 3 of the Project Area		
Type	**Lentic Water Name**	
Lakes/Ponds	Perennial	Burke Reservoir
		Garrison Reservoir
		Burlington Reservoir
		Fraser Reservoir
	Intermittent	Graham Reservoir
		Reid Reservoir
		Hiland Reservoir
		Pine Tree Reservoir
		Kirk Reservoir
		Adobe Reservoir
		Dead Horse Reservoir
Reservoirs	Cow Camp Reservoir	
Swamps/Marshes	Stampede Bog	

3.2.20.3.3 Impaired Waters

As authorized by the EPA under the CWA, the NPDES controls water pollution by regulating point sources that discharge pollutants into waters of the U.S. Point sources are discrete conveyances such as pipes or man-made ditches that can be traced back to the original source. Since 1972 the NPDES is responsible for significant improvements to water quality through the regulation of discharges from point sources.

Wyoming's Integrated 305(b) and 303(d) Water Quality Assessment Report (305[b] Report) summarizes water quality conditions in the state. Streams, rivers, ponds, and lakes that do not support their designated uses are considered "impaired." The 305(b) Report includes Wyoming's 303(d) List of Waters Requiring TMDLs, which identifies waters "impaired" by one or more pollutants and require development of TMDLs. The state updates this list of streams, rivers, ponds, and lakes every 2 years and uses the list to develop a TMDL allocation of pollutants. Once TMDLs are developed for specific waters, the waters are removed from the 303(d) List; however, the waters are still considered "impaired" until credible data

shows that they are fully supporting their designated uses. These "impaired" waters are identified in the 305(b) Report.

Nonpoint source pollution, unlike pollution from a discrete source, comes from many diffuse sources and is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, streams, and groundwater. However, pollution in stormwater runoff from many activities, such as road and pipeline construction, is regulated as a point source under the WYPDES program. Other nonpoint source pollution, such as runoff from rangeland and agricultural areas, is not regulated by the EPA or WDEQ; however, the BLM applies BMPs and other management actions to reduce nonpoint source pollution.

3.2.20.3.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

No waters crossed by alternative routes in Segment 1 are listed on the CWA 303(d) list of impaired waters by the WDEQ.

3.2.20.3.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

The 2-mile study area along Segment 2 includes one waterbody crossed by alternative routes classified as CWA 303(d) Impaired Waters (Table 3-133). The impaired section of the Little Sandy River is located approximately 2 miles northeast (upstream) of Alternative 2A: Proposed Action and 32 miles northeast (upstream) of Alternative 2B: Southern Route.

Table 3-133
Clean Water Act 303(d) List of Impaired Waters that Occur in Segment 2 of the Project Area

Category	Description
Waterbody	Little Sandy River
Location	From the northern boundary of Section 33, Township 28 North-Range 104 West-downstream 17.7 miles to the Sublette/Sweetwater county line
Miles	17.7
Uses	Cold water game fishery and aquatic life other than fish
Cause(s)	Sediment
Source(s)	Livestock and wildlife grazing, historic habitat modification
List Date	2012
TMDL Date	2016
SOURCE: WDEQ 2014	

3.2.20.3.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

One waterbody crosses the 2-mile study area along the Segment 3 alternative route is listed as a CWA 303(d) Impaired Water by the WDEQ (Table 3-134).

Table 3-134
Clean Water Act 303(d) List of Impaired Waters that Occur in Segment 3 of the Project Area

Category	Description
Waterbody	Crooks Creek
Location	From the confluence with Mason Creek to a point 1.4 miles downstream
Miles	1.4
Uses	Cold water, game fishery, aquatic life other than fish
Cause(s)	Oil and Grease
Source(s)	Petroleum Production

Table 3-134 Clean Water Act 303(d) List of Impaired Waters that Occur in Segment 3 of the Project Area	
Category	**Description**
List Date	1998
TMDL Date	2022
SOURCE: WDEQ 2014	

3.2.20.3.4 Wyoming Water Classification and Designation

The Department of Environmental Quality – Water Quality Division developed water quality standards that are documented in Chapter 1, Wyoming Water Quality Rules and Regulations and are available at http://deq.wyoming.gov/wqd/surface-water-quality-standards/. Water quality degradation of Class 1 and Class 2 streams is not permitted. The surface water quality standards are divided based on four surface water classifications (WDEQ 2013):

- Class 1, Outstanding Waters. Class 1 waters are those surface waters in which no further water quality degradation by point source discharges other than from dams will be allowed. Nonpoint sources of pollution shall be controlled through implementation of appropriate BMPs. Pursuant to Section 7 of these regulations, the water quality and physical and biological integrity that existed in the water at the time of designation will be maintained and protected. In designating Class 1 waters, the Environmental Quality Council shall consider water quality; aesthetic, scenic, recreational, ecological, agricultural, botanical, zoological, municipal, industrial, historical, geological, cultural, and archaeological values; fish and wildlife; the presence of significant quantities of developable water; and other values of present and future benefit to the people.
- Class 2, Fisheries and Drinking Water. Class 2 waters are waters, other than those designated as Class 1, that are known to support fish or drinking water supplies or where those uses are attainable. Class 2 waters may be perennial, intermittent, or ephemeral and are protected for the uses indicated in each sub category. Like Class 1 streams, water quality degradation of Class 2 streams is not permitted. There are five subcategories of Class 2 waters: 2AB, 2A, 2B, 2C, and 2D.
    - Class 2AB waters and their contributing perennial tributaries and adjacent wetlands are known to support game fish populations or spawning and nursery areas. Class 2AB waters include all permanent and seasonal game fisheries and can be either "cold water" or "warm water." Class 2AB waters are also protected for drinking water supplies, nongame fisheries, fish consumption, and aquatic life other than fish, as well as recreation, wildlife, industry, agriculture, and scenic value.
    - Class 2A waters are not known to support, nor do they have the potential to support, game fish, but these waters are used for public or domestic drinking water supplies.
    - Class 2B waters are known to support game fish populations or spawning and nursery areas at least seasonally and where it has been shown that drinking water use is not attainable.
    - Class 2C waters are known to support, or have the potential to support, only nongame fish populations or nursery areas at least seasonally.
    - Class 2D waters are effluent-dependent waters that are known to support fish populations and where the resident fish populations would be significantly degraded in terms of numbers or species diversity if effluent flows were removed or reduced.
- Class 3, Aquatic Life Other than Fish. Class 3 waters are waters, other than those designated as Class 1, that are intermittent, ephemeral, or isolated waters and because of natural habitat conditions, do not support nor have the potential to support fish populations or spawning, or

certain perennial waters that lack the natural water quality to support fish (e.g., geothermal areas). Class 3 waters provide support for invertebrates, amphibians, or other flora and fauna that inhabit waters of the State at some stage of their life cycles. Uses designated on Class 3 waters include aquatic life other than fish, recreation, wildlife, industry, agriculture, and scenic value. Generally, waters suitable for this classification have wetland characteristics, and such characteristics will be a primary indicator used in identifying Class 3 waters. There are four subcategories of Class 3 waters: 3A, 3B, 3C, and 3D.

- Class 3A waters are isolated waters, including wetlands, that are not known to support fish populations or drinking water supplies and where those uses are not attainable.
- Class 3B waters are tributary waters, including adjacent wetlands, that are not known to support fish populations or drinking water supplies and where those uses are not attainable. Class 3B waters are intermittent and ephemeral streams with sufficient hydrology to normally support and sustain communities of aquatic life, including invertebrates, amphibians, or other flora and fauna that inhabit waters of the State at some stage of their life cycles.
- Class 3C waters are perennial streams without the natural water quality to support fish or drinking water supplies but with the quality to support wetland characteristics.
- Class 3D waters are effluent-dependent waters known to support communities of aquatic life other than fish and where the existing aquatic habitat would be significantly reduced in terms of aerial extent, habitat diversity, or ecological value if effluent flows are removed or reduced.

- Class 4, Agriculture, Industry, Recreation and Wildlife. Class 4 waters are waters, other than those designated as Class 1, where it has been determined that aquatic life uses are not attainable pursuant to the provisions of Section 33 of [the] regulations. Uses designated on Class 4 waters include recreation, wildlife, industry, agriculture, and scenic value. There are three subcategories of Class 4 waters: 4A, 4B, and 4C.
  - Class 4A waters are artificial canals and ditches that are not known to support fish populations.
  - Class 4B waters are intermittent and ephemeral stream channels that have been determined to lack the hydrologic potential to normally support and sustain aquatic life.
  - Class 4C waters are isolated waters that have been determined to lack the potential to normally support and sustain aquatic life.

Table 3-135 summarizes the surface water classes and use designations in Wyoming.

Table 3-135
Surface Water Classes and Use Designations in Wyoming

Wyoming Water Classification	Use Designation									
	Drinking water	Game Fish	Non-game Fish	Fish Consumption	Other Aquatic Life	Recreation	Wildlife	Agriculture	Industry	Scenic Value
1[1]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2AB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2A	✓	⊘	⊘	⊘	✓	✓	✓	✓	✓	✓
2B		✓	✓	✓	✓	✓	✓	✓	✓	✓
2C	⊘	⊘	✓	✓	✓	✓	✓	✓	✓	✓

Table 3-135
Surface Water Classes and Use Designations in Wyoming

Wyoming Water Classification	Use Designation									
	Drinking water	Game Fish	Non-game Fish	Fish Consumption	Other Aquatic Life	Recreation	Wildlife	Agriculture	Industry	Scenic Value
2D	⦸	When Present	When present	✓	✓	✓	✓	✓	✓	✓
3A	⦸	⦸	⦸	⦸	✓	✓	✓	✓	✓	✓
3B	⦸	⦸	⦸	⦸	✓	✓	✓	✓	✓	✓
3C	⦸	⦸	⦸	⦸	✓	✓	✓	✓	✓	✓
3D	⦸	⦸	⦸	⦸	✓	✓	✓	✓	✓	✓
4A	⦸	⦸	⦸	⦸	⦸	✓	✓	✓	✓	✓
4B	⦸	⦸	⦸	⦸	⦸	✓	✓	✓	✓	✓
4C	⦸	⦸	⦸	⦸	⦸	✓	✓	✓	✓	✓

SOURCE: WDEQ 2013
NOTES:
[1]Class 1 waters are not protected for all uses in all circumstances. For example, all waters in the National Parks and Wilderness are Class 1; however, all do not support fisheries or other aquatic life uses (e.g., hot springs, ephemeral waters, wet meadows etc.). For stormwater permitting, 401 Certification, and water quality assessment purposes, the actual uses on each particular water must be determined independently.
✓ = Class present for use designation
⦸ = Class not present for use designation

Locations where the pipeline alternative routes cross perennial, intermittent, or ephemeral streams were evaluated using several methods. Each crossing was examined using a database in shapefile format that was provided by the WDEQ. The WDEQ shapefile contained stream class information for numerous drainages in the Project area but did not appear to be a complete dataset. Based on the WDEQ shapefile, it is noted that no Class 1 waters were located within 20 miles of any pipeline segment.

Where stream classification data were not available in the WDEQ shapefile and not readily discernable based on comparison with the Wyoming Surface Water Classification List, the stream class could not be identified.

The BLM provided EPG with a database containing the results of their Proper Functioning Condition (PFC) assessment of drainages on BLM-administered lands in the Project area. The PFC refers to both 1) the process of assessing the condition of riparian wetland areas and 2) the actual condition of a riparian area. The PFC assessment methodology is composed of the following qualitative rankings:

- A riparian-wetland area is defined as a PFC if the system functions properly when adequate vegetation, landform, or debris is present to:
  - dissipate energies associated with wind action, wave action, and overland flow from adjacent sites, thereby reducing erosion and improving water quality;
  - filter sediment and aid floodplain development;
  - improve flood-water retention and groundwater recharge;
  - develop root masses that stabilize islands and shoreline features against cutting action;
  - restrict water percolation;
  - develop diverse ponding characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, water bird breeding, and other uses; and
  - support greater biodiversity.

- "Functional–At Risk" ranking includes riparian-wetland areas that are in functional condition but have an existing soil, water, or vegetation attribute that makes them susceptible to degradation.
- "Nonfunctional" ranking include 2.20.4.1.1s riparian-wetland areas that are not providing adequate vegetation, landform, or woody debris to dissipate energies associates with flow events and, thus, are not reducing erosion or improving water quality.
- "Unknown" ranking includes riparian-wetland areas for which there is a lack of sufficient information to make any form of determination.

Drainages that cross the pipeline segments and included in the PFC database were ranked by the BLM as in a PFC. However, not all drainages crossed by the pipeline were included in the BLM's PFC database. The PFC rating is only applicable to public lands and was not performed on private lands.

Table 3-136 presents the stream classes and relevant subbasins crossed by each of the alternative routes. The stream classes presented in the table are based on information provided by the WDEQ and only include streams classified by the WDEQ.

Table 3-136
Surface Water Crossings

Alternative Route	Number of Crossings Per Stream Class				
	Class 2AB	Class 2C	Class 3B	Class 4B	HUC-8 Watershed
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	4	0	0	0	Upper Green
1A Variation: Dry Basin Draw	4	0	0	0	Upper Green
1B: Dry Piney	3	0	1	0	Upper Green
1C: Figure Four	5	0	3	0	Upper Green
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	3	1	6	0	Upper Green-Slate; Big Sandy; Great Divide Closed Basin; Sweetwater
2B: Southern Route	2	0	8	0	Upper Green-Slate; Big Sandy; Bitter; Great Divide Closed Basin; Sweetwater
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	3	0	15	0	Sweetwater; Muskrat; South Fork Powder; Middle North Platte-Casper
3B: Lost Creek to Lost Cabin	2	1	8	1	Sweetwater; Muskrat; Lower Wind; Badwater
3C: Lost Creek to Highway 20/26	2	3	8	0	Sweetwater; Muskrat; Lower Wind; South Fork Powder; Middle North Platte-Casper

SOURCES: WDEQ 2013, USGS 2016

3.2.20.4 Groundwater

Groundwater is water that is stored in aquifers below the ground surface. An aquifer is a geological formation that stores and transmits groundwater. Unconsolidated formations are composed of sediment and typically are relatively shallow with groundwater stored in pore spaces between the grains. Massive bedrock aquifers comprising igneous or metamorphic rocks predominantly store and transmit groundwater in fractures, and aquifers comprising of sedimentary rocks can store groundwater in both fractures and within pore spaces. In both unconsolidated and bedrock aquifers, groundwater is discharged naturally from the system through seeps or springs or as base flow into perennial surface waterbodies.

Groundwater is also removed from the system through man-made water production wells used for agricultural and industrial use and through domestic and municipal water supply wells.

The segments cross four watershed basins for major rivers in southwestern Wyoming. The basins include the Green River Basin, the Platte River Basin, the Powder Tongue River Basin, and the Wind/Bighorn River Basin.

Six principal types of aquifers are in the Project area. There are five sandstone aquifer systems: Upper Tertiary (Miocene and Oligocene), Lower Tertiary (Eocene and Paleocene), and Upper Cretaceous, Lower Cretaceous, and Quaternary sedimentary deposits. The Project also includes an aquifer and confining unit system in Segment 3 that is classified as Mesozoic.

Groundwater seeps, springs, and wells provide water sources for municipalities, private wells, livestock, and wildlife in the Project area. Springs and seeps occur where groundwater discharges to the ground surface. Spring discharge may vary seasonally and even diurnally as groundwater conditions change due to variances in precipitation and evapotranspiration. Seeps are similar to springs but typically produce low volumes of groundwater discharge, are often ephemeral, and may be strongly controlled by precipitation.

Aquifer sensitivity is the relative ease with which a contaminant applied on the land surface can migrate to the shallowest aquifer. The susceptibility of an aquifer to contamination is dependent on several variables specific to the hydrogeological and climatological environment and the physical properties of the soil and aquifer. The *Wyoming Ground Water Vulnerability Assessment Handbook: Volume 1* details a method to calculate relative aquifer sensitivity in Wyoming. The method is a modified version of the EPA's DRASTIC method and uses the depth to groundwater, recharge, soil media, slope of the ground surface, impact of the vadose zone, and the geohydrologic setting. The result is a quantitative estimate of aquifer sensitivity that ranges from 12 to 60. The relative aquifer sensitivity divides the group into classes based on the following ranges: low = 12 to 25, medium-low = 26 to 30, medium = 31 to 36, medium-high = 37 to 42, and high = 43 and above. The aquifer sensitivity in the study area has been calculated by the Wyoming Groundwater Vulnerability Mapping project.

3.2.20.4.1.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Segment 1 is in the northwest portion of the Green River Basin. This section of the watershed is further divided into the HUC 8-digit subbasin identified as the Upper Green River watershed. In addition to the pipeline, two injection wells will be installed near the Riley Ridge Sweetening Plant at the western-most end of Segment 1. The bedrock formations that constitute the regional aquifers are known as the Eocene epoch Laney Shale Member of the Green River Formation, the New Fork Tongue of the Wasatch Formation and the Fontanelle Tongue of the Green River Formation, and the Eocene-Paleocene La Barge and Chappo Members of the Wasatch Formation. These geologic units stem from the major Upper Colorado River Basin aquifer system. The Eocene aquifer system is extensive and coincides with the boundaries of the Green River Basin (Clarey et al. 2010). Although the lithology largely comprises marlstone and shale, usable water can be found in the sandstone layers of the uppermost Laney Member and provides fresh to slightly saline water that is sufficient for domestic and livestock use (Whitehead 1996). The Wasatch Formation is reported to have a thickness ranging from less than 1,000 feet across the northern and middle Rock Springs Uplift to over 4,000 feet thick in parts of the Green River Basin. The New Fork Tongue of the Wasatch Formation and the Fontanelle Tongue of the Green River Formation consist of sandstone with thin limestone beds (New Fork Tongue) and interbedded mudstone (Fontanelle Tongue). The nomenclature used in the *Available Groundwater Determination Technical Memorandum* for the Green River Basin (Clarey et al. 2010) identifies the aquifer in these formations as the Farson Sandstone-Alkali Creek Aquifer. The average concentration of TDS in water samples collected from the Wasatch Formation in wells installed at depths ranging from 190 to 1,020 feet was 1,030 mg/L, with

salinity generally increasing with depth (AMEC Environment & Infrastructure, Inc. 2013). Segment 1 and the injection wells (surface completions) are in the recharge and outcrop area of the Wasatch Formation, although the geologic zones targeted for injection are in much deeper and older locations (Table 3-51 and Figure 2-1). The Laney and Wasatch Formations serve as sources for the springs, seeps, and wells in most of Segment 1. The La Barge and Chappo Members of the Wasatch Formation consist of mudstone, conglomerate, and sandstone. Younger discontinuous Quaternary-aged deposits also locally serve as unconsolidated aquifers in drainage channels, along gentle slopes and alluvial fans. Some constituents that exceeded EPA or Wyoming water-quality standards have been measured in groundwater samples collected from each aquifer and could limit the suitability for some uses. After selecting a preferred alternative route, a water source(s) capable of providing a sufficient volume of water of acceptable water quality will be identified by the owner and proper permission(s) for water use will be obtained through Wyoming Water Rights permitting process prior to beginning construction (Section 2.2.3.5).

The two acid gas H_2S injection wells will be drilled to approximately 20,000-feet below ground surface (Figure 2-1). Both injection wells will be constructed with multiple protective cement sleeves and liners to protect shallow and deep aquifers as required by the UIC program. All zones with possibility of oil and gas production will be covered with cement and all usable water bearing formations, as determined by Wyoming, will be protected by surface cementing operations. Based on review of water wells contained in the SEO database for wells located within a 2-mile radius of Segment 1, water production wells are generally installed at depths ranging from less than 10 feet to 1,000 feet below ground surface. Ten wells listed as domestic/stock use were greater than 1,000 feet deep, with the deepest well installed at 3,000 feet. Irrigation wells were installed at depths ranging from 180 to 670 feet, and one industrial well was installed at a depth of 2,339 feet. The nearest water production wells used for human consumption are located along the Green River valley approximately 10 miles west of the injection wells. The domestic wells range in depth from 30 to 600 feet below ground surface. The injection wells will be installed with casing and cement filling the annular space between the casing and the borehole walls from the ground surface to approximately 17,700 feet below ground surface. Injection is anticipated to occur in the Madison and Big Horn formations, which are vertically separated from usable aquifers by several thousand feet. The injected formations outcrop at or near the surface at the base of the Wyoming Range mountain uplifts located approximately 24 miles west of the injection well site. Specific information regarding geologic units anticipated to be encountered, the anticipated occurrence of fluids in the formations, and BMPs are described in Appendix B in the POD (included as Appendix A of this EIS). The casing and cementing program is described in further detail in Section 2.2.1.2 of Chapter 2 and illustrated in Figure 2-1.

Table 3-137 summarizes the data collected by the USGS for wells and springs located in each formation, as reported in the *Available Groundwater Determination Technical Memorandum* (Clarey et al. 2010).

Table 3-137
Aquifers Present along Segment 1

Formation	Well Yield Range[1]	Well Yield Median[1]	Springs Discharge Range[1]	Springs Discharge Median[1]	Aquifer Transmissivity[2]	Hydraulic Conductivity[2]
Quaternary - Alluvium	0.2 to 85	5	20 to 300	138	40 to 2,680	27
Farson Sandstone-Alkali Creek Aquifer	1 to 30	15	15	15	26 to 707	0.2 to 46
La Barge Aquifer	0.5 to 280	4 to 12	5	5	46 to 2,680	0.6 to 8
Laney Aquifer	1 to 2,250	2 to 17	2 to 2,700	10	5 to 47,900	0.2 to 1,450

NOTES: [1]square feet per day; [2]gallons per minute (gpm)

According to the well records obtained from the Wyoming SEO, 84 well permits and are located within a 2-mile-wide corridor along Segment 1 (Table 3-138) (Wyoming SEO 2016). The SEO wells were installed at depths ranging from less than 10 feet to 2,339 feet and the depth to groundwater ranged from 3 feet to 1,250 feet. The reported well yield ranged from 1 to 200 gpm. The USGS also constructed numerous groundwater monitoring wells near Segment 1. A total of 9 wells were installed by the USGS in the search radius along Segment 1 (USGS 2016). One well was identified as completed in the Lower Tertiary formations, and the source aquifer for the remaining wells was not identified. The bottoms of the wells were installed at depths ranging from 128 to 855 feet.

Table 3-138
Water Well Usage Within a 2-Mile-Wide Corridor of Alternative Routes in Segment 1

Segment	Coalbed Methane	Domestic	Industrial	Irrigation	Monitoring	Miscellaneous	Stock
1A: Proposed Action	0	5	8	0	0	1	8
1A Variation: Dry Basin Draw	0	2	5	0	0	0	3
1B: Dry Piney	0	4	5	0	37	5	10
1C: Figure Four	0	7	11	0	35	5	10

Segment 1 also includes a total of seven springs within a 2-mile-wide corridor (USGS 2016). The database indicates that three of the springs are named, and four are not named. The named springs within 1 mile of each Segment 1 alternative are shown in Table 3-139.

Table 3-139
Named Springs/Seeps within a 2-Mile-Wide Corridor of Alternative Routes in Segment 1

Alternative Route	Spring/Seep Name
1A: Proposed Action	Unnamed Springs (4)
1A Variation: Dry Basin Draw	None Identified
1B: Dry Piney	DeGraw Spring Unnamed Springs (4)
1C: Figure Four	DeGraw Spring Tip Top Spring Unnamed Springs (5)

The aquifer sensitivity along Segment 1 ranged from 19 to 47, with an average of 33.6. Table 3-140 summarizes the relative sensitivity along each sub-segment of the Segment 1 alternative routes.

Table 3-140
Aquifer Sensitivity for Segment 1

Alternative Route	Total Miles	Sensitivity (miles affected)				
		Low	Medium-Low	Medium	Medium-High	High
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant						
1A: Proposed Action	30.4	0.9	11.0	10.1	2.6	5.8
1A Variation: Dry Basin Draw	30.7	0.9	10.9	11.7	2.6	4.6
1B: Dry Piney	34.5	1.3	11.2	12.3	4.2	5.5
1C: Figure Four	38.5	2.0	11.3	16.0	4.1	5.1
SOURCE: Wyoming Water Development Office (WWDO) 2016						

3.2.20.4.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

The majority of Segment 2 crosses the Red Desert in the north-central portion of the Green River Basin, with approximately 7.6 miles of Segment 2 crossing into the Platte River Basin. Wyoming's Red Desert is a high-elevation desert where, relative to other segments, groundwater resources are limited. Groundwater use in the western portion of Alternatives 2A: Proposed Action and 2B: Southern Route are varied and include municipal, irrigation, stock, industrial, and domestic water use. The greatest concentration of wells lies between Alternatives 2A: Proposed Action and 2B: Southern Route in the vicinity of the Big Sandy River. Several of the wells in these areas supply groundwater for use in the agricultural industry (stock and irrigation wells) and as domestic water supply. Municipal wells are quite common, as are industrial wells, although to a lesser extent. The eastern portions of Alternatives 2A: Proposed Action and 2B: Southern Route cross the Red Desert. The availability of water from subterranean sources in the Red Desert is scarce. The majority of wells supply groundwater for domestic water supply and industrial use, such as monitoring wells and test wells. Irrigation wells and stock wells are present in this area, but they are geographically widespread. The water source availability depends on whether Alternatives 2A: Proposed Action and 2B: Southern Route will be selected as the Preferred Alternative. After selecting a preferred alternative route, a water source(s) capable of providing a sufficient volume of water of acceptable water quality will be identified by the owner and proper permission(s) for water use will be obtained through Wyoming Water Rights permitting process prior to beginning construction.

The characteristics of the formations that constitute regional aquifers were obtained from the *Available Groundwater Determination Technical Memorandums* for the Green River Basin and the Platte River Basin (Clarey et al. 2010, Taucher et al 2013). The Wilkins Peak and Tipton Shale members normally act as confining units and comprise dolomitic mudstone, marlstone, and shales. Although these formations are not typically used as a source of groundwater, data for one production well and multiple springs were available. Mudstone banded with massive lenses and beds of muddy sandstone form the Cathedral Bluffs Tongue of the Wasatch Formation. The referenced documents indicated that a majority of the groundwater was fresh and occasionally slightly saline. The Bridger Formation serves as an aquifer composed of fractured sandstone, tuff, and shale. Groundwater recharges the Bridger Formation along the Uinta Mountains and discharges along the Smiths Fork, Blacks Fork, and Green River. Most of the groundwater was fresh with slightly to moderately saline water also occasionally encountered. The lower Tertiary Battle Spring Formation consists of sandstone and conglomerates that form a shallow major aquifer. Nearly all of the groundwater was fresh. The main body of the Wasatch Formation is a thick (2,300 to 3,600 feet) deposit of shale, claystone, sandstone, conglomeratic sandstone, and marly limestone. Interbedded sandstones generally provide most of the groundwater to wells completed in the aquifer. Portions of Segment 2 that cross the area near continental divide, Table Mountain and the Alkali Basin, are in the recharge and outcrop area of the Wasatch Formation. The Almond Formation of the Mesaverde Group is characterized by deposits associated with sea transgressions and regressions. The depositional environment formed sedimentary deposits with varying lithologies, but interbedded sandstones compose the aquifer. The majority of the groundwater was fresh, but slightly to very saline waters exist in the aquifer. Specific data related to well yield, spring discharge, and aquifer characteristics were not available. Some constituents that exceeded EPA or Wyoming water-quality standards have been measured in groundwater samples collected from each aquifer and could limit the suitability for some uses. Younger discontinuous Quaternary-aged deposits also locally serve as unconsolidated aquifers in drainage channels, playa lake deposits, and other dune sand or wind-blown sediment called loess. The unconsolidated deposits are interbedded mixtures of clay, silt, sand, and gravel. The deposits are typically hydrologically connected to surface water streams. Well yield varies widely, with many wells producing less than 10 gpm and some irrigation wells producing several hundred gpm. Based on the limited distribution and fine-grained sediments, playa lake deposits are not known to serve as aquifers or spring sources. Higher yields are generally produced along perennial streams where clean sand and gravel

deposits produce a greater transmissivity of groundwater. Some constituents that exceeded EPA or Wyoming water-quality standards have been measured in groundwater samples collected from each aquifer and could limit the suitability for some uses.

Table 3-141 summarizes the data collected by the USGS for wells and springs located in major aquifers, as reported in the *Available Groundwater Determination Technical Memorandum* (Clarey et al. 2010). To avoid repetition of major aquifers, only new major aquifers have been summarized in the table. Other aquifers may be found along Segment 2 and have been summarized in previous tables.

Table 3-141
Aquifers Present along Segment 2

Formation	Well Yield Range[1]	Well Yield Median[1]	Springs Discharge Range[1]	Springs Discharge Median[1]	Aquifer Transmissivity[2]	Hydraulic Conductivity[2]
Quaternary – Landslide	No Data	No Data	2 to 200	19	No Data	No Data
Quaternary – Dune Sand	2 to 3	No Data	1 to 20	No Data	No Data	No Data
Battle Spring Aquifer	10 to 400	10	3	3	20 to 880	0.0007 to 10
Bridger Aquifer	6 to 32	11	0.5 to 150	4	4 to 5,223	0.03 to 423
Cathedral Bluffs	20 to 30	25	No Data	No Data	90	No Data
Main Body of the Wasatch Formation	2 to 440	20	0.2 to 20	2	0.09 to 40,836	0 to 2,106
Tipton Confining Unit	5 to 26	18	1 to 9	6	40	0.05 to 11
Wilkins Peak Confining Unit	2	2	0.8 to 75	4	No Data	No Data

NOTES:
[1]square feet per day
[2]gallons per minute

According to the well records obtained from the Wyoming SEO, 57 well permits are located within a 2-mile corridor along Segment 2 (Table 3-142) (Wyoming SEO 2016). The SEO wells were installed at depths ranging from less than 36 feet to 4,695 feet and the depth to groundwater ranged from 3 feet to 1,005 feet. The reported well yield ranged from 2.5 gpm up to 450 gpm. The USGS also constructed numerous groundwater monitoring wells near Segment 2. A total of 37 wells were installed by the USGS within a 2-mile corridor along Segment 2 (USGS 2016). Three wells were identified as completed in the Lower Tertiary formations and the completion formations of the remaining wells were not identified. The wells were completed at depths ranging from 8 feet to 1,029 feet.

Table 3-142
Water Well Usage within a 2-Mile-Wide Corridor of Alternative Routes in Segment 2

Alternative Route	Coalbed Methane	Domestic	Industrial	Irrigation	Monitoring	Miscellaneous	Stock
2A: Proposed Action	5	3	2	2	3	5	12
2B: Southern Route	9	3	4	1	5	5	21

Per the USGS National Hydrography Database and from analysis of USGS topographic maps, 26 springs are located within a 2-mile corridor of Segment 2 (WWDO 2016). The database and topographic maps

indicate that 5 of the springs are named, and 3,241 are not named. The named springs within 2 miles of each Segment 2 alternative route are shown in Table 3-143.

Table 3-143
Named Springs/Seeps and Wells within a 2-Mile-Wide Corridor of Alternative Routes in Segment 2

Alternative Route	Spring/Seep Name
2A: Proposed Action	Chicken Springs (North) Juel Spring North Sublette Meadow Spring Rock Cabin Spring Unnamed Springs (19)
2B: Southern Route	Chicken Springs (South) Unnamed Springs (9)

The majority of springs along Segment 2 occur in the western portion of the Great Divide Basin along the perimeter of Bush Rim. A small number of springs are present near the northern portion of the Great Divide Basin. The Laney Member of the Green River Formation is exposed along the upper portions of Bush Rim. The Laney Member is comprised of sedimentary rocks, including sandstone, shale, and mudstone, and forms a portion of the Laney aquifer. The Cathedral Bluffs Tongue of the Wasatch Formation is comprised of mudstones with interbedded sandstones and is located east of the Laney Member and downslope of Bush Rim. Several springs, including Chicken Springs along Alternative 2A: Proposed Action on Bush Rim, appear to discharge at the interface between the Laney Member and the Cathedral Bluffs Tongue. At a meeting with the BLM at the Rock Springs Filed Office in 2014, Denbury agreed to install the pipeline on the east side of the Bar X road, parallel to the road, through the Chicken Springs area. This routing will result in the pipeline being located downslope of the Chicken Springs. The Laney Member serves as a potential recharge area for several of these springs. Another spring, also identified as Chicken Springs, also occurs along Alternative 2B: Southern Route near White Mountain.

The aquifer sensitivity along Segment 2 ranged from 16 to 50, with an average of 33.9. Table 3-144 summarizes the relative sensitivity along each sub-segment of the Segment 2 alternative routes.

Table 3-144
Aquifer Sensitivity for Segment 2

Alternative Route	Total Miles	Sensitivity (miles affected)				
		Low	Medium-Low	Medium	Medium-High	High
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect						
2A: Proposed Action	129.1	15.8	44.3	38.6	14.8	15.6
2B: Southern Route	136.2	7.4	66.4	16.4	16.5	29.5

SOURCE: WWDO 2016

3.2.20.4.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Segment 3 crosses portions of three major watersheds, including the Platte River Basin, the Powder Tongue River Basin, and the Wind/Bighorn River Basin. Wells are generally well-distributed along Segment 3, with clusters of wells located near Jeffrey City and the Beaver Divide. Most wells near Jeffrey City are designed as monitoring wells in the SEO database and are owned by the radionuclide mining industry. The remaining wells in the SEO database have the following use classifications: domestic, stock, and municipal water supply wells. The majority of wells near the Beaver Divide are classified for industrial, monitoring, or miscellaneous use. However, several stock wells, and, occasionally, domestic and municipal wells, are also located near Beaver Divide. Groundwater wells along the remaining portions of Segment 3 are classified for use in the agricultural industry (stock and irrigation wells) and as

domestic water supplies. After selecting a preferred alternative route, a water source(s) capable of providing a sufficient volume of water of acceptable water quality will be identified by the owner and proper permission(s) for water use will be obtained through Wyoming Water Rights permitting process prior to beginning construction.

This section of the watershed is further divided into six HUC 8-digit subbasins identified as the Upper Green River, Upper Green-Slate River, Big Sandy River, Bitter River, Great Divide Closed Basin, and Sweetwater River watersheds.

The characteristics of the formations that constitute regional aquifers were obtained from the *Available Groundwater Determination Technical Memorandum* publications for the Platte River Basin, the Powder Tongue River Basin, and the Wind/Bighorn River Basin (Taucher et al. 2013, HKM Engineering 2002, Taucher et al. 2012).

Paleocene, Eocene, Oligocene, and Miocene rocks constitute the most widely used bedrock aquifers along Segment 3. The Fort Union Formation, Battle Spring Formation, Wind River Formation, White River Formation, and Miocene Rocks are composed of sandstone, shale or mudstone, conglomerates, and/or occasional coal beds. The Fort Union Formation is considered to be a principal aquifer by the USGS. Well yields are generally less than 15 gpm but production rates up to 500 gpm are possible. Transmissivity ranges from 55 to 240 square feet per day and water quality is variable. The Fort Union aquifer is an important source for stock and domestic wells, but salinity is generally too high for agricultural use. The Battle Spring Formation is considered to be an important water source, but its extent is limited in the Platte River Basin. Both well yield and water quality are considered to be suitable. The Wind River Formation serves mainly domestic and stock wells due to poor well yield and water quality. Since little information is available for the White River Formation, groundwater production statistics are not available. Miocene rocks consist of sandstones and local conglomerates. Groundwater production is not well understood in this formation, but available pumping test data indicate that the well yield ranged from 4 to 15 gpm. Like the unconsolidated aquifers encountered in Segments 1 and 2, Quaternary-aged deposits are also found in drainage channels, alluvial fans, and loess deposit in Segment 3. Well production and water quality are generally consistent throughout each segment.

Cretaceous rocks, which are described in Section 3.2.4, are typically buried deeply and few wells are completed in these aquifers. In isolated instances, tectonic forces have brought older rocks to the surface, where they may be suitable aquifers. Several of these deposits, including the Lance Formation and Fox Hills Formation, serve as major aquifers in the region. However, well yields are generally less than 15 gpm with an estimated transmissivity from 76 to 2,100 square feet per day. The quality of the water from these wells is frequently poor, and due to high salinity, the water is not often used for irrigation or domestic uses. The Frontier Formation and Mesaverde Formation or Group are composed of shale with beds of sandstone and serve as minor aquifers. Water quality is mainly fresh, but slight to moderate salinity is present. Other Cretaceous rocks, such as the Meeteetse Formation, Lewis Shale, and Cody Shale, are major confining units. Older rocks outcrop at the ground surface along portions of Segment 3. The Triassic Chugwater and Dinwoody Formations are confining units comprising siltstone and shale. The Cloverly Formation consists of sandstone with interbedded shale and siltstone. When groundwater in a well rises above the ground surface without pumping, the well is called a flowing artesian well. Wells installed in the Cloverly Formation are occasionally artesian with flowing yields of up to 40 gpm. The yield for pumped wells installed in this formation can reach up to 250 gpm. Transmissivity ranges from 7 to 230 gallons per day (gpd) per foot (1 to 25 square feet per day). The Cloverly Formation is known to supply water to springs where it outcrops. Ancient Precambrian granitic, metasedimentary, and metavolcanic rocks are located along Segment 3 in the Platte River Basin. The hydrogeologic role of these rocks is not known; however, they may serve as a source for radionuclides.

The hydrogeologic characteristics of the aquifers along Segment 3 were obtained from the *Platte River Basin Water Plan Update* (Taucher et al. 2013), *Powder/Tongue River Basin Plan Final Report* (HKM Engineering 2002), and the *Wind/Bighorn River Basin Water Plan Update* (Taucher et al. 2012).

Per the well records obtained from the Wyoming SEO, 328 well permits are located within a 2-mile corridor along Segment 3 (Table 3-145) (SEO 2016). The SEO wells were installed at depths ranging from less than 10 feet to 3,000 feet and the depth to groundwater ranged from 1 foot to 360 feet. The reported well yield ranged from less than 1 gpm to 2,500 gpm. The USGS also constructed numerous groundwater monitoring wells near Segment 3. A total of 17 wells were installed by the USGS within a 2-mile corridor along Segment 3 (USGS 2016). The well installation depth and source aquifers for the wells were not identified.

Table 3-145
Water Well Usage within a 2-Mile-Wide Corridor of Alternative Routes in Segment 3

Alternative Route	Municipal	Domestic	Industrial	Irrigation	Monitoring	Miscellaneous	Stock
3A: Proposed Action	4	34	7	0	99	22	47
3B: Lost Creek to Lost Cabin	4	35	7	0	99	29	47
3C: Lost Creek to Highway 20/26	4	62	7	2	102	33	82

Segment 3 also includes 10 springs within a 2-mile corridor (WWDO 2016). The database indicates that five of the springs are named and five are not named. The named springs in the buffer area along Segment 3 are shown in Table 3-146.

Table 3-146
Named Springs/Seeps and Wells within a 2-Mile-Wide Corridor of Alternative Routes in Segment 3

Alternative Route	Spring/Seep Name
3A: Proposed Action	Collins Spring Coyote Spring JE Sulphur Spring Puddle Springs Unnamed Springs (4)
3B: Lost Creek to Lost Cabin	Coyote Spring Puddle Springs Unnamed Springs (3)
3C: Lost Creek to Highway 20/26	Coyote Spring Puddle Springs Waltman Spring Unnamed Springs (4)

The aquifer sensitivity along Segment 3 ranged from 19 to 46, with an average of 34.4. Table 3-147 summarizes the relative sensitivity along each sub-segment of the Segment 3 alternative routes.

Table 3-147 Aquifer Sensitivity for Segment 3						
Alternative Route	**Total Miles**	**Sensitivity (miles affected)**				
		Low	**Medium-Low**	**Medium**	**Medium-High**	**High**
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect						
3A: Proposed Action	83.2	5.7	26.2	24.3	25.0	2.0
3B: Lost Creek to Lost Cabin	73.0	2.1	8.3	29.3	26.7	6.6
3C: Lost Creek to Highway 20/26	101.4	2.6	21.7	30.3	37.0	9.8

3.2.20.5 Floodplains

Floodplains are topographically flat areas adjacent to waterbodies that are seasonally or occasionally inundated during high water periods. Floodplain soils contain high volumes of sediment and nutrients. Formerly known as a 100-year floodplain, the FEMA know designates and maps floodplain Special Flood Hazard Areas defined by peak flood elevations. The insurance industry, state and local governments, and resource management agencies use the Special Hazard Flood Areas for regulating rates, development, and management of floodplains. Floodplains are managed for maintaining function as well limiting risks. FEMA Special Flood Hazard Areas are limited to developed areas and municipalities, therefore large areas in Wyoming are not identified with Special Flood Hazard Areas.

Project related floodplain oversight will be implemented under federal Executive Order 11988: Floodplain Management (1977) and the Wyoming BLM RMPs. Special Flood Hazard Areas are closed to construction of new buildings and facilities and proposals for linear crossings in these areas will be determined by case (BLM 1997).

3.2.20.5.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Segment 1 rivers and streams with Special Flood Hazard Areas are tributaries of the Green River, the majority of which occur near their confluence with the river (Table 3-148).

Table 3-148 Waterways with Special Flood Hazard Areas in Segment 1 of the Project Area		
Waterway Names		
Alkali Creek	Dry Piney Creek	Muddy Creek
Basin Draw	Figure Four Canyon Creek	New Fork River
Beaver Creek	Fish Creek	North Piney Creek
Beaver Dam Creek	Fogarty Creek	Reardon Draw
Birch Creek	Green River	Sixty Seven Reservoir
Bird Canyon Creek	Meadow Canyon Creek	South Piney Creek
Black Canyon Creek	Middle Piney Creek	South Piney Creek
Chapel Canyon Creek	Milleson Draw	West Meadow Canyon Creek
Deer Hill Draw		
SOURCE: FEMA 2015		

Ephemeral streams have the ability to produce flooding after large precipitation and snowmelt events (refer to Section 3.2.20.3 for more information on ephemeral streams). No ephemeral streams occur in Segment 1 of the Project area.

3.2.20.5.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

The Segment 2 rivers and streams with Special Flood Hazard Areas are Green River or Big Sandy River tributaries located in the west half of the segment. Floodplains occurring near the big river confluences are mapped as Special Flood Hazard Areas. There are also few creeks and streams higher in the watersheds of Segment 2 mapped as Special Flood Hazard Areas. Table 3-149 lists the waterways in the west half of Segment 2 that have Special Flood Hazard Areas. The eastern half of Segment 2 has not been mapped for hazard areas by FEMA.

Table 3-149
Waterways with Special Flood Hazard Areas in Segment 2 of the Project Area

Waterway Names		
Alkali Creek	East Buckhorn Draw	Pacific Creek
Alkali Wash	Eden Reservoir	Parnell Creek
Big Sandy Reservoir	Jack Morrow Creek	Rock Cabin Creek
Big Sandy River	Jonah Gulch	Sand Draw
Buckhorn Draw	Jue Reservoir	Water Hole Draw
Bull Draw	Little Sandy Creek	West Buckhorn Draw
Canyon Creek	Mud Hole Draw	Whitehorse Creek
Dry Sandy Creek	Mud Hole Reservoir	

SOURCE: FEMA 2015
NOTE: Data is of the west half of Segment 2 No data is available for the east half of Segment 2.

Ephemeral streams can produce flooding after large precipitation and snowmelt events (refer to Section 3.2.20.3 for more information on ephemeral streams). No ephemeral streams occur in Segment 2 of the Project area.

3.2.20.5.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Segment 3 has no mapped FEMA Special Flood Hazard Area. The nearest mapped Special Flood Hazard Areas is the City of Lander and Riverton.

Ephemeral streams can produce flooding after large precipitation and snowmelt events (refer to Section 3.2.20.3 for more information on ephemeral streams). Four ephemeral streams occur in Segment 3 of the Project area.

3.2.20.6 Drinking Water and Sole Aquifers

Wyoming drinking water is sourced from surface waters and groundwater. The Project lies in four River Basins: Green River Basin, Platte River Basin, Powder/Tongue River Basin, and the Wind/Bighorn River Basin. However, the majority of the Project lies in the Green River Basin. Table 3-150 summarizes the municipal and domestic water use for each river basin in the Project area per the 2007 Wyoming Framework Water Plan Volume 1 of the Wyoming Water Development Commission (WWC Engineering et al. 2007). Municipal water uses are those that satisfy the public water supply system. Domestic water uses are those that satisfy individual wells and small water systems.

Table 3-150
Municipal and Domestic Water Use of River Basins in the Project Area

River Basin	Demand Factor[1] (gallons per capita per day)	Surface Water (gpd)		Groundwater (gpd)	
		Municipal	Domestic	Municipal	Domestic
Green River[2]	133	18,682,000	≈ 0	646,000	2,598,000
Platte River[3]	197	5,981,000		15,891,000	
Powder/Tongue River	270	6,446,000	≈ 0	91,000	2,135,000
Wind/Bighorn River	207	8,300,000	1,157,000	3,904,000	5,314,000

SOURCE: WWC Engineering et al. 2007
NOTES:
[1]The demand factor is based on the average use of the basin. The uses are calculated in gpd.
[2]Surface water data are "depletions" instead of "uses." Surface water data also includes 12.9 million gpd for the City of Cheyenne, which may be counted as 13 million gpd in the Platte River Basin total.
[3]Includes 13 million gpd for the City of Cheyenne in total, which may be duplicated in the Green River Basin. The Platte River Basin is also the only basin to report conjunctive uses.

Only two sole source aquifers are in Wyoming, the Elk Mountain Aquifer (located in Southeast Wyoming in Carbon County) and the eastern stream flow source area of the Eastern Snake River Plain Aquifer (located in western Wyoming in northern Sublette County) (EPA 2015d). Neither the Elk Mountain Aquifer nor the stream flow source area of the Eastern Snake River Plain Aquifer is in the Project area.

The Source Water Wellhead Protection program helps protect public and rural well water and surface water intake from contamination. A source water assessment is conducted as a part of the program. Wyoming is the only state in the country to not require a source water assessment. However, more than 385 public water systems in Wyoming have voluntarily participated (WDEQ 2015a). The assessment consists of delineation of source water area, an inventory of contamination sources in the area, an analysis of possible sources of contamination, and an assessment report of the findings and information.

The source water area is divided into three zones during the assessment. Zone 1, the accident prevention zone or sanitary protection zone, is an immediate, highly protected area around the wellhead or surface water intake location. It protects the well or intake area from the direct introduction of contaminants into the well from immediate spills, surface runoff, or leakages (WDEQ 1997). Zone 2, the attenuation zone, is established to protect the well or intake area from pathogenic microorganisms (e.g., bacteria and viruses) that may originate from a source close to the well or intake area. Zone 2 is also established to provide adequate emergency response time for cleanup in case a pathogen or chemical contaminant is introduced to the aquifer near the wellhead or surface water intake area (WDEQ 1997). Zone 3, the remedial action zone, is established to protect the well or intake area from chemical contaminants that may migrate to the well or intake area. Zone 3 is a large area to provide time to respond to a contaminant release and allow adequate time to develop a new drinking water source if necessary (WDEQ 1997).

3.2.20.6.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Segment 1 is in the northwest area of the Green River Basin. The three major towns located in Segment 1 are Big Piney, Marbleton, and La Barge. The Town of La Barge obtains its primary water supply from surface water, while the towns of Big Piney and Marbelton obtain their primary water supply from groundwater. Table 3-151 describes the surface water use for La Barge. Table 3-152 describes the groundwater uses for Big Piney and Marbleton.

Table 3-151 La Barge Surface Water Use			
Town	**Population**	**Source River**	**Gallons Per Capita Per Day**
La Barge	490	Green River	251
SOURCE: WWC Engineering et al. 2007			

Table 3-152 Big Piney and Marbleton Groundwater Use					
Town	**Population**	**Number of Wells**	**Well Depth (feet)**	**Gallons Per Capita Per Day**	**Total acre feet**
Big Piney	496	4	90 to 900	90	50
Marbleton	635	5	580 to 830	787	560
SOURCE: WWC Engineering et al. 2007					

Per the Source Water Wellhead Protection Program Source Water Assessment of the WDEQ, Segment 1 contains only zone 3 surface water intake areas. Zone 1 and zone 2 wellhead and surface water intake areas are not located in Segment 1.

Segment 1 includes construction of the proposed Riley Ridge Sweetening Plant with two proposed disposal injection wells for H_2S. Each well will be designed on 3.9-acre well pads with the following features:

- Upper well protective well casings in anticipation of shallow aquifers
- Closed loop systems with no open pits
- A second and third tier of protective casings to a depth of approximately 19,000 below ground surface to protect deeper aquifers and provide well stability.

A diagram that summarizes the injection well design is provided in Figure 2-1.

Design requirements of the WOGCC, which oversees Class II injection wells, are intended to ensure that injection wells are constructed to prevent the migration of fluids outside the injection zone, thereby protecting groundwater resources. Construction of the disposal injection wells is anticipated to occur over a 2-year schedule. Construction drilling cuttings and fluids will be recovered in tanks (utilizing a closed loop system) and disposed of at an approved facility. BMPs described in Appendices H and K of the POD (Appendix A) will project shallow groundwater during the construction phase. Monitoring and reporting requirements for Class II injection wells will provide the WOGCC with documentation that the injection wells are operating in accordance with permit limitations, thereby demonstrating that the operation of these two injection wells is not threatening human health or the environment.

3.2.20.6.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Segment 2 is in the north central region of the Green River Basin, the majority in Sweetwater County, Wyoming. The Green River Basin Water Plan of the Wyoming Water Development Office states that the joint power board of the City of Rock Springs, City of Green River, and Sweetwater County obtain their primary municipal water supply from surface water of the Green River (Wyoming Water Development Office 2010a). Primary domestic water supply in Sweetwater County is obtained by groundwater resources through wells (WWC Engineering et al. 2007).

The Source Water Wellhead Protection Program Source Water Assessment identified zone 1 and zone 2 as wellhead protection areas (no zone 1 or 2 surface water intake protection areas), and zone 3 surface water intake protection areas (no zone 3 wellhead protection areas) in Segment 2.

3.2.20.6.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Segment 3 is in three river basins: Platte River Basin, Wind/Bighorn River Basin, and Powder/Tongue River Basin. The Project area is in the northwest region of the Platte River Basin, the southeast region of the Wind/Bighorn River Basin, and the southwest region of the Powder/Tongue River Basin.

The Project area is in the Above Pathfinder Subbasin of the Platte River Basin. Most the municipalities in this region utilize surface water with a small portion using groundwater as their primary water supply. A population of 784 relies on groundwater as their primary source, while a population of 3,693 relies on surface water as their primary source, and a population of 9,730 relies on conjunctive water use (a combination of wells, springs, and surface water) (WWDO 2006). The nearest town to the Project area is Jeffrey City in Fremont County, which relies on groundwater as its primary water supply. Table 3-153 describes the groundwater use in Jeffrey City.

Table 3-153
Jeffrey City Groundwater Use

Town	Population	Wells	Average Daily Use (gallons per day)	Peak Daily Use (gallons per day)
Jeffrey City	50	2 Arikaree aquifer wells	11,300	28,750

SOURCE: WWDO 2006

The Project area is in the Badwater (HUC 10080006), Lower Wind (HUC 1008005), and Muskrat (HUC 1008004) subbasins of the Wind/Bighorn River Basin. Domestic groundwater wells are the primary source for drinking water in the Wind/Bighorn River Basin of the Project area (MWH Americas, Inc. et al. 2010).

The Project area is in the South Fork Powder (HUC 10090203) subbasin of the Powder/Tongue River Basin. Most the water use in the South Fork Powder subbasin is domestic and from groundwater sources with a limited source from surface water for rural home lawns and gardens (Wyoming Water Development Office 2002).

The Source Water Wellhead Protection Program Source Water Assessment identified zone 1 and zone 2 as wellhead protection areas (no zone 1 or 2 surface water intake protection areas), and both zone 3 surface water intake and wellhead protection areas in Segment 3.

3.2.21 Wetlands and Riparian Areas

Wetlands are ecosystems defined by persistently wet, oxygen-poor saturated upper soil layers; persistent hydrology; and vegetation unique to these physical conditions. The USACE defines jurisdictional wetlands using three indicators: hydric soils, greater than 50 percent cover of hydrophytic plant species, and the presence of water at or above the soil surface for an adequate period (USACE 1987). Wetlands serve many critical ecosystem functions, including: natural flood control, carbon storage and retention, pollution (nutrients, sediments, heavy metals) transformation, groundwater recharge, and wildlife habitat (Copeland et al. 2010).

In this analysis, wetlands were identified using the National Wetlands Inventory (NWI) dataset (USFWS 2015b), which classifies wetlands into broad categories per the Cowardin Classification scheme (Cowardin et al. 1979). The Cowardin Classification hierarchically classifies wetlands and deepwater habitats based on their (1) dominant geomorphic and hydrologic features (System), (2) dominant vegetation and substrate (Class), and (3) the timing and extent of inundation (Water Regime), as well as any alterations to the Water Regime (Special Modifiers). The three systems encountered in the Project are

Palustrine (groundwater), Lacustrine (lakes, ponds, and impoundments), and Riverine (flowing waters of creeks, streams, and rivers).

These classifications are summarized by the Cowardin Code, which gives one letter for the system, two letters for the class, one letter for the water regime, and sometimes one lowercase letter for a special modifier. The Cowardin Code description provides the full name of the wetland type and associated water regime or special modifier, if applicable.

Riparian areas are transitional zones from terrestrial to aquatic ecosystems located along waterbodies. The vegetation is strongly influenced by the presence of water and is an integral part linking the different environments in a watershed. In this analysis, riparian areas were identified using reclassified GAP data. The GAP dataset and the reclassification methods used are described in Section 3.2.18.3. Riparian areas provide important habitat for many wildlife and plants, despite riparian areas comprising less than 1 percent of the western landscape (Knopf et al. 1988, Montgomery 1996). Regionally, riparian areas provide important habitat for migratory bird species, big game, greater sage-grouse, fish and aquatic invertebrates, and reptiles and amphibians. Riparian areas serve as migration and habitat corridors.

The BLM's PFC classification system is defined as the presence of adequate vegetative cover, favorable riparian landforms, and/or amounts of large woody debris and cover on riparian areas. These factors function to dissipate stream energy from high waterflows, reduce erosion, and improve water quality (Barrett et al. 1993). The functioning conditions serve as management metrics for riparian areas on public lands for land uses, including livestock grazing, timber harvest, mineral extraction, recreation, and construction. The system is applied statewide on BLM-administered land and serves as a tool for describing riparian functional quality for the Project.

3.2.21.1 Regulatory Framework

Supplemental authorities that influence activities related to wetlands in the study area are primarily implemented by the USACE and the WDEQ. Relevant regulations, policies, and plans with which the Project must comply for wetlands are presented below.

3.2.21.1.1 Federal Wetland Regulations

- Federal Executive Order 11990: Protection of Wetlands advises agencies to take action to avoid the adverse impacts associated with the destruction or modification of wetlands.
- The CWA, Section 404: Dredge or Fill in waters of the U.S., including wetlands, regulates the dredging or filling of any material in a water of the U.S., including wetlands. If the Project requires the dredge or fill in a water of the U.S. as defined in 33 CFR Part 328.3 of the CWA, it may be necessary to obtain a general or individual permit to conduct the work. As a provision of the federal permitting process, mitigation for the permanent loss of jurisdictional wetlands or other waters of the U.S. may be required.
- Section 10 of Rivers and Harbors Appropriation Act of 1899 regulates construction below the Ordinary High Water elevation of navigable waters, including tributaries and backwater, of the U.S. A permit is required for dredge, fill, or other disturbance of soils/sediments below the Ordinary High Water of a navigable waterway. Work authorizations are provided under the same permitting process as Section 404 of the CWA.

3.2.21.1.2 State Wetland Regulations

The Wyoming Wetlands Act is a notification program for parties wanting to drain a wetland of 5 acres or more. There is no application or approval process; however, the party seeking a drainage statement must

fill out the appropriate paperwork to the WDEQ. A mitigation banking program is established for the drainage activities under the Wyoming Wetlands Act.

3.2.21.1.3 Federal Riparian Management Plans

Although federal law does not regulate riparian areas, many riparian zones include wetlands and other waters of the U.S. and may be subject to federal and/or state policies and regulation under the CWA, Rivers and Harbors Appropriation Act of 1899, and federal Executive Order 11990, among others. However, many management plans incorporate BMPs for riparian zones and are presented below.

- U.S. Department of Agriculture, NRCS policy requires the NRCS to include riparian management plans into all development plans and alternatives.
- BLM Resource Management Plans, Record of Decisions, and Approved Management Framework Plans for Wyoming, including Casper (2007), Lander (2014), Pinedale (2008), Rawlins (2008), and Rock Springs (1997) Field Offices, specify regulations and goals for the management of BLM-administered lands and set restrictions to protect fish and wildlife and the habitats on which they depend. These management plans also include riparian areas management plans.

3.2.21.1.4 State Riparian Management Plans

- WDEQ Livestock/Wildlife Best Management Practice Manual 2013, Best Management Practice 11, describes BMPs for grazing runoff into riparian areas.

3.2.21.2 Regional Setting

The Wyoming Joint Ventures Steering Committee, a multiagency partnership working toward improving wetland management, has identified 9 of the 221 wetland complexes in Wyoming as statewide priorities for management and conservation (Copeland et al. 2010). The wetland complexes are identified as the highest density wetland areas in Wyoming (wetland densities greater than 1 per square kilometer). The Green River Basin is the only Wyoming wetland complex located in the study area. Two broad riparian classifications are present in Wyoming: mountain riparian habitats and lowland riparian habitats (NatureServe 2009). Higher elevation mountain riparian habitat is characterized by steep stream gradients, less soil deposition, cooler temperatures, and vegetative communities dominated with grassy sedges and shrubby willows (Winward 2000). Dominant woody species below treeline include narrowleaf cottonwood, willow, pine, spruce, and poplar (Knight 1994). The lowland riparian habitats occur in the basins and larger floodplains at lower elevations. Cottonwood and willows dominate the tree and shrub canopy with ground cover comprising grasses and herbs (Knopf et al. 1988, Montgomery 1996, Braatne et al. 1996).

3.2.21.3 Wetlands

3.2.21.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

The quantity and extent of NWI mapped wetlands, by Cowardin wetland type, present in the 1-mile analysis area for all alternative routes in Segment 1 are presented in Table 3-154.

Table 3-154
Cowardin Wetland Types in Segment 1

Cowardin Wetland Type	Cowardin Code	Cowardin Code Description	Quantity	Acres
Palustrine Emergent	PEMA	Palustrine emergent, temporarily flooded	44	1,009
	PEMAh	Palustrine emergent, temporarily flooded, diked/impounded	2	<1
	PEMC	Palustrine emergent, seasonally flooded	50	71
	PEMCh	Palustrine emergent, seasonally flooded, diked/impounded	1	<1
	PEMFx	Palustrine emergent, semipermanently flooded, excavated	1	<1
	Total		98	1,080
Palustrine Forested/Palustrine Shrub	PFOA	Palustrine forested, temporarily flooded	1	1
	PSSA	Palustrine scrub-shrub, temporarily flooded	71	881
	PSSC	Palustrine scrub-shrub, seasonally flooded	17	27
	Total		89	909
Palustrine Unconsolidated Bottom, Palustrine Aquatic Bed	PABF	Palustrine aquatic bed, semipermanently flooded	18	16
	PABFh	Palustrine aquatic bed, semipermanently flooded, diked/impounded	17	18
	PABFx	Palustrine aquatic bed, semipermanently flooded, excavated	3	1
Palustrine Unconsolidated Bottom, Palustrine Aquatic Bed	PABGb	Palustrine aquatic bed, intermittently exposed, beaver	8	3
	PUBFx	Palustrine unconsolidated bottom, semipermanently flooded, excavated	28	5
	Total		74	43
Riverine Wetland and Deepwater	R2UBH	Riverine, lower perennial, unconsolidated bottom, permanently flooded	1	262
	R2USA	Riverine, lower perennial, unconsolidated shore, temporarily flooded	7	8
	R2USC	Riverine, lower perennial, unconsolidated shore, seasonally flooded	49	79
	Total		57	349

SOURCE: USFWS 2015b
NOTES:
The Cowardin System is a comprehensive classification system of wetlands and deepwater habitats that was developed for the USFWS in 1979 (Cowardin et al. 1979).
Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Segment 1 of the Project area is in the Green River Basin. The basin is considered a Wyoming wetland complex by the Wyoming Joint Ventures Steering Committee due to a basin wetland density greater than 1 per square kilometer. Segment 1 includes 12.68 miles (240 acres) of the Green River. The Green River flows into the Flaming Gorge Reservoir located on the border of Wyoming and Utah, which is a jurisdictional waterway under Section 10 of the Rivers and Harbors Act. Therefore, permitting is required for any dredge or fill construction below the Ordinary Water High elevation of the Green River.

While Segment 1 is proportionally smaller in area, it has higher wetland acreages than the other two Project segments.

3.2.21.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

The quantity and extent of NWI mapped wetlands, by Cowardin Wetland Type, present in the 1-mile analysis area for all alternative routes in Segment 2 are presented in Table 3-155.

Table 3-155
Cowardin Wetland Types in Segment 2

Cowardin Wetland Type	Cowardin Code	Cowardin Code Description	Quantity	Acres
Palustrine Emergent	PEMA	Palustrine emergent, temporarily flooded	72	148
	PEMAh	Palustrine emergent, temporarily flooded, diked/impounded	5	11
	PEMB	Palustrine emergent, saturated	6	2
	PEMC	Palustrine emergent, seasonally flooded	194	275
	PEMCh	Palustrine emergent, seasonally flooded, diked/impounded	3	1
	PEMF	Palustrine emergent, semipermanently flooded	8	3
	Total		288	439
Palustrine Forested/Palustrine Shrub	PSS/EMA	Palustrine scrub-shrub/emergent, temporarily flooded	2	5
	PSSA	Palustrine scrub-shrub, temporarily flooded	27	26
	PSSC	Palustrine scrub-shrub, seasonally flooded	4	4
	Total		33	35
Palustrine Unconsolidated Bottom, Palustrine Aquatic Bed	PABF	Palustrine aquatic bed, semipermanently flooded	15	20
	PABFh	Palustrine aquatic bed, semipermanently flooded, diked/impounded	17	25
	PABFx	Palustrine aquatic bed, semipermanently flooded, excavated	3	1
	PABGb	Palustrine aquatic bed, intermittently exposed, beaver	7	2
	PUBFx	Palustrine unconsolidated bottom, semipermanently flooded, excavated	1	1
	Total		43	49
Lacustrine Wetland and Deepwater	L2USA	Lacustrine littoral, unconsolidated shore, temporarily flooded	1	9
	Total		1	9
Riverine Wetland and Deepwater	R2UBH	Riverine, lower perennial, unconsolidated bottom, permanently flooded	4	50
	R2USA	Riverine, lower perennial, unconsolidated shore, temporarily flooded	17	9
	R2USC	Riverine, lower perennial, unconsolidated shore, seasonally flooded	8	3
	R3USA	Riverine, upper perennial, unconsolidated shore, temporarily flooded	1	0
Riverine Wetland and Deepwater	R4USA	Riverine, intermittent, unconsolidated shore, temporarily flooded	2	11
	R4USF	Riverine, intermittent, unconsolidated shore, semipermanently flooded	2	4
	Total		34	77

SOURCE: USFWS 2015
NOTES:
The Cowardin System is a comprehensive classification system of wetlands and deepwater habitats that was developed for the USFWS in 1979 (Cowardin et al. 1979).
Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Segment 2 has fewer numbers and acres of wetland types than Segment 1 due to its location in the arid Great Divide Basin in Segment 2. Palustrine emergent seasonally flooded wetlands are the most extensive wetland type. These seasonal wetlands are important habitats, especially where they are located outside of floodplains and riparian areas. The forested, shrub, and deepwater wetland types in Segment 2 are typically associated with riparian areas and floodplains.

3.2.21.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

The quantity and extent of NWI mapped wetlands, by Cowardin Wetland Type, present in the 1-mile analysis area for all alternative routes in Segment 3 are presented in Table 3-156.

Table 3-156
Cowardin Wetland Types in Segment 3

Cowardin Wetland Type	Cowardin Code	Cowardin Code Description	Quantity	Acres
Palustrine Emergent	PEMA	Palustrine emergent, temporarily flooded	75	395
	PEMAh	Palustrine emergent, temporarily flooded, diked/impounded	29	46
	PEMB	Palustrine emergent, saturated	9	2
	PEMC	Palustrine emergent, seasonally flooded	287	870
	PEMCh	Palustrine emergent, seasonally flooded, diked/impounded	27	42
	PEMCx	Palustrine emergent, seasonally flooded, excavated	1	1
	PEMF	Palustrine emergent, semipermanently flooded	34	158
	PEMFh	Palustrine emergent, semipermanently flooded, diked/impounded	5	2
	Total		467	1,516
Palustrine Forested/ Palustrine Shrub	PSSA	Palustrine scrub-shrub, temporarily flooded	29	57
	PSSB	Palustrine scrub-shrub, saturated	1	<1
	PSSC	Palustrine scrub-shrub, seasonally flooded	20	39
	Total		50	97
Palustrine Unconsolidated Bottom, Palustrine Aquatic Bed	PABF	Palustrine aquatic bed, semipermanently flooded	13	13
	PABFh	Palustrine aquatic bed, semipermanently flooded, diked/impounded	42	45
Palustrine Unconsolidated Bottom, Palustrine Aquatic Bed	PABFx	Palustrine aquatic bed, semipermanently flooded, excavated	4	1
	PABG	Palustrine aquatic bed, intermittently exposed	1	<1
	PABGb	Palustrine aquatic bed, intermittently exposed, beaver	19	6
	PABHh	Palustrine aquatic bed, permanently flooded, diked/impounded	1	1
	PUBFx	Palustrine unconsolidated bottom, semipermanently flooded, excavated	28	23
	Total		79	89
Lacustrine Wetland and Deepwater	L1UBHh	Lacustrine limnetic, unconsolidated bottom, permanently flooded, diked/impounded	1	35
	L2ABGh	Lacustrine littoral, aquatic bed, intermittently exposed, diked/impounded	2	30

Table 3-156
Cowardin Wetland Types in Segment 3

Cowardin Wetland Type	Cowardin Code	Cowardin Code Description	Quantity	Acres
Lacustrine Wetland and Deepwater	L2USAh	Lacustrine littoral, unconsolidated shore, temporarily flooded, diked/impounded	1	36
	L2USCh	Lacustrine littoral, unconsolidated shore, seasonally flooded, diked/impounded	2	2
	Total		6	103
Riverine Wetland and Deepwater	R2UBH	Riverine, lower perennial, unconsolidated bottom, permanently flooded	2	42
	R4USA	Riverine, intermittent, unconsolidated shore, temporarily flooded	3	58
	Total		5	100

SOURCE: USFWS 2015b
NOTES:
The Cowardin System is a comprehensive classification system of wetlands and deepwater habitats that was developed for the USFWS in 1979 (Cowardin et al.).
Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Segment 3 is characterized by higher, more diverse wetland types than Segment 3). A greater number of streams and rivers are present in Segment 3. Segment 3 is in closer proximity to mountain ranges and has more diverse landforms conducive to wetland formation.

3.2.21.4 Riparian Areas

3.2.21.4.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

The riparian vegetation communities identified using GAP landcover data can be separated into several, finer-scale landcover types based on NatureServe's Ecological System classification descriptions (NatureServe 2009). The type and extent of riparian ecological systems occurring in Segment 1 are presented below Table 3-157.

Table 3-157
GAP Riparian Areas in Segment 1

Riparian Ecological System	Acres
Introduced Riparian and Wetland Vegetation	1,067
Western Great Plains Floodplain	558
Western Great Plains Riparian Woodland and Shrubland	844
Total	2,469

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Segment 1 has 67 PFC areas totaling 647 acres of lotic waters (Table 3-158).

Table 3-158
Lotic Proper Functioning Conditions in Segment 1

Lotic Water Name	Allotment	Number of PFC Areas in Allotment	Total PFC Acres
Beaver Creek	Beaver Tract Individual	1	26
Green River	Various	39	256
South Piney Creek	South Piney Ranch Individual	1	36
Spring Creek – Lower	North La Barge Common + 2 unallocated	5	90
	Beaver Creek Ind, Beaver Cr Meadow	2	136
Spring Creek, Main	North La Barge Common	19	103
Total		67	647

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Segment 1 has a relatively high total acreage of riparian areas. This is attributable to its proximity to the Green River, a higher landscape complexity, and a greater density of streams.

3.2.21.4.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

The type and extent of riparian ecological systems occurring in Segment 2 are presented below (Table 3-159).

Table 3-159
GAP Riparian Areas in Segment 2

Riparian Ecological System	Acres
Introduced Riparian and Wetland Vegetation	3
Western Great Plains Floodplain	257
Western Great Plains Riparian Woodland and Shrubland	6975
Total	7235

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Segment 2 has 12 PFC areas totaling 615.42 acres of lotic waters (Table 3-160).

Table 3-160
Lotic Proper Functioning Conditions in Segment 2

Lotic Water Name	Allotment	Number of PFC Areas in Allotment	Total PFCs Acres
Big Sandy River	Reservoir	7	110
Dry Sandy Creek	Little Prospect and Little Sandy	1	188
Mowing Machine Draw	Bush Rim	1	136
Rock Cabin Creek	Bush Rim	1	24
	Pacific Creek	1	115
No name	No name	1	42
Total		12	615

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

While Segment 2 is large in area and is arid, there is a relatively high amount of riparian acreage.

3.2.21.4.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

The type and extent of riparian ecological systems occurring in Segment 3 are presented below Table 3-161).

Table 3-161
GAP Riparian Areas in Segment 3

Riparian Ecological System	Acres
Northwestern Great Plains Riparian	21
Western Great Plains Floodplain	757
Western Great Plains Riparian Woodland and Shrubland	2,100
Total	2,878

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Segment 3 has eight PFC areas totaling 137 acres of lotic waters, and two areas totaling 13 acres of lentic waters (Table 3-162).

Table 3-162
Lotic Proper Functioning Conditions in Segment 3

Lotic Water Name	Allotment	Number of PFC Areas in Allotment	Total PFCs Acres
Lotic Waters			
South Fork Powder Trib	00244	1	14
Wallace Creek	10020	1	16
Wyatt Draw	20523	4	31
Not applicable	Not applicable	2	76
Total		8	136
Lentic Waters			
Not applicable	Not applicable	2	13
Total		2	13

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Segment 3 is a large area with a comparable amount of riparian area total acreage to Segment 1 (Table 3-161).

3.2.22 Wild Horses and Burros

Table 3-163 indicates the number of wild horse and burro HMA allotments crossed by the 2-mile-wide corridor, total allotment acres, total acres affected by the Project, and affected alternative routes.

Table 3-163
Wild Horse and Burro Herd Management Areas in the Alternative Route Study Corridor

Management Agency	Number of Herd Management Areas Crossed	Total Acres of Herd Management Area	Total Acres Affected by the Project	Relevant Segments
BLM Lander Field Office	4	411,841	20,856	All Segments 2 and 3
BLM Pinedale Field Office	1	228	121	All Segments 1 and 2
BLM Rawlins Field Office	3	308,686	14,994	All Segment 2
BLM Rock Springs Field Office	3	1,798,002	155,885	All Segments 1 and 2

The BLM is responsible for the protection, management and control of wild horses and burros. Under the Wild Free-Roaming Horses and Burros Act, wild horses and burros are considered an integral part of the national system of public lands in the areas they were found in 1971. The BLM's goal is to manage healthy wild horse and burro populations on healthy rangelands. To achieve this goal, the BLM also prescribes management to assure wild horse and burro populations are in balance with other uses of public lands and that a thriving natural ecological balance (TNEB) is achieved and maintained. A resource report prepared by the Applicant (SWCA 2014a) was used as the basis for this inventory, and updated and supplemented with BLM and secondary source GIS spatial data and aerial photo interpretation.

3.2.22.1 Regulatory Framework

3.2.22.2 Federal Laws Related to Management of Wild Horses

During the 1950s, documented abuses of wild horses led concerned individuals and national humane organizations to push for federal protections of wild horses. Subsequently, Congress passed the Wild Horse Annie Act in 1959 prohibiting the use of aircraft or motor vehicles to capture or kill wild horses or burros on public lands and polluting watering holes on public lands to trap, kill, wound or maim wild horses or burros. Despite the 1959 act, wild horse exploitation continued. To protect wild horses and burros, Congress passed additional legislation in 1971 titled the Wild Free-Roaming Horses and Burros Act of 1971 to require the protection and management of wild horses and burros on public lands. The 1971 act was amended by the FLPMA of 1976 and the Public Rangelands Improvement Act of 1978.

- Wild Horse Annie Act of 1959 (P.L. 86-234) establishes criminal penalties for using an aircraft or motor vehicle to hunt wild horses or burros on public lands for capturing or killing and for polluting watering holes on public lands to trap, kill, wound, or maim wild horse or burros.
- Wild Free-Roaming Horses and Burros Act of 1971 (P.L. 92-195) directs the Secretaries of the Interior and Agriculture to protect and manage wild horses and burros as components of the public lands to achieve and maintain a TNEB. Once information becomes available to the to the Secretary that an overpopulation of wild horses and burros exists on a given area of the public lands, the Secretary "may order old, sick, or lame animals to be destroyed in the most humane manner possible, and he may cause additional excess wild horse and burros to be captured and removed for private maintenance under humane conditions and care" (P.L. 92-195 3(b)). The act also establishes criminal penalties for a number of offenses involving wild horses and burros.
- FLPMA of 1976 (P.L. 94-579) directs the Secretary of the Interior to prepare and maintain an inventory of public lands and their resources and other values and with public involvement, to develop, maintain, and revise land-use plans, which provide for the use of public lands. The FLPMA also directs the Secretary to manage the public lands under the principles of multiple use and sustained yield. This act also authorizes the Secretaries of the Interior and Agriculture to contract for the use of helicopters and for using motor vehicles to transport captured animals after a public hearing and in accordance with humane procedures.
- Public Rangelands Improvement Act of 1978 (P.L. 95-514) directs the Secretaries of the Interior and Agriculture to maintain a current inventory of wild horses and burros on given areas of public lands to determine whether and where overpopulation exists and whether to remove excess animals, the appropriate management levels (AML), and whether AMLs could be achieved by removal or destruction of excess animals or through other options.

3.2.22.2.1 BLM Manual 4700 and BLM Handbook 4700-1

The current versions of the BLM manual 4700 and BLM Handbook H-4700-1 released July 7, 2010 provides guidance for all aspects of wild horse and burro protection and management as well as defines terms commonly used when describing wild horse and burro protection and management activities.

Two important terms describing wild horse habitat are herd area and HMA. Herd area is defined in 43 CFR 4700.0-5 (d) and further explained in H4700-1 as the "Geographic areas of the public lands identified as habitat used by wild horse and burros at the time the Wild Free-Roaming Horses and Burros Act was enacted (December 15, 1971)." Direction for establishment of an HMA is provided in 43 CFR 4710.3-1. HMA is defined in H4700-1 as Herd management areas shall be established for the maintenance of wild horse and burrow herds. "In delineating each herd management area, the authorized officer shall consider the appropriate management level for the herd, the habitat requirements of the animals, the relationships with other uses of the public and adjacent private lands, and the constraints contained in 43 CFR 4710.4." (H-4700-1).

Guidance contained in the BLM Handbook 4700-1 states: "Where appropriate, the land-use plan may include decisions not to manage wild horse and burros in all or a part of an HA." An example given in the handbook is "where essential habitat components (forage, water, cover and space) are unavailable or insufficient to sustain healthy wild horse and burros and healthy rangelands over the long term." (H-4700-1 2.1.4).

Where land-use plans include decisions to designate HMAs within all or a portion of a herd area, wild horses must be managed to achieve and maintain a TNEB and multiple use relationships on the public lands. TNEB means "wild horse and burros are managed in a manner that assures significant progress is made toward achieving the Land Health Standards for upland vegetation and riparian plant communities, watershed function, and habitat quality for animal populations…" Before issuing a decision to gather and remove animals, the BLM Authorized Officer will analyze multiple factors to determine whether excess animals are present and removal is necessary to restore or maintain the range in a TNEB.

3.2.22.3 Regional Setting

The Project area is situated in the Wyoming Basin and Middle Rocky Mountains physiographic provinces. These provinces are discussed in detail in Section 3.2.18. The topography as it relates to HMAs in the Project area consists of rolling hills, high plateaus, tall buttes, and significant canyons with some small streams. Other topographic features include vegetative dunes and desert playas with sensitive wetland riparian areas including both intermittent and perennial lakes and streams. HMAs elevation in the Project area ranges from 6,200 feet to 8,200 feet. Vegetation in the Project area consists of sagebrush, grass, saltbrush, and winterfat intermixed with greasewood.

3.2.22.3.1 Populations and Management

The state of Wyoming currently recognizes 16 HMAs. These 16 areas comprise 3,664,002 acres of public land, 154,737 acres of land owned by Wyoming, and 846,243 acres of privately owned lands. Much of the private acreage consists of land owned or controlled by the Rock Springs Grazing Association of Southwestern Wyoming.

3.2.22.3.1.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Table 3-164 lists the HMAs crossed by the 2-mile-wide study corridors in Segment 1.

Table 3-164 Wild Horse Management Areas in Segment 1		
Herd Name	**Herd Management Area Unit**	**Acres[1]**
Little Colorado	WY039	632,328
NOTE: [1]Acres rounded to the nearest whole number		

Little Colorado Herd Management Area

The majority of the HMA consists of consolidated public lands along with state school sections and, in the south of the HMA, U.S. Bureau of Reclamation lands. The HMA is bounded on the west by the Green River, on the east by Highway 191, and on the north by the Pinedale/Rock Springs Field Office boundary. The HMA is in the Rock Springs Field Office (BLM 2013f).

The area is mostly rolling hills with significant canyons breaking up the area. Elevations range from approximately 6,300 to 7,900 feet, and precipitation ranges from 6 to 10 inches, predominately in the form of snow. The area is unfenced except for sections of the boundary fence between the Rock Springs and Pinedale Field Offices, and along Highway 191. The HMA is divided among Sublette, Lincoln, and Sweetwater counties (BLM 2013f).

The AML for this HMA is 100 horses. Most horses in this area are dark -bay, sorrel, brown, black or gray. The Wyoming horses have a diverse background of many domestic horse breeds. They are most closely related to North American gaited breeds such as Rocky Mountain Horse, American Saddlebred, Standardbred, and Morgan. The horses range from 14 to 15.5 hands and weigh between 750 and 1,100 pounds mature weight. The horse health is good with no apparent problems (BLM 2013f).

Domestic cattle and sheep utilize the area lightly in the summer and moderately in the winter. Vegetation in the HMA is dominated by sagebrush/grass, with saltbrush, winterfat, greasewood, and meadow species. Horses typically use a high amount of grass species, the most favorable being needlegrass, Indian ricegrass, wheatgrass, and sedges. The area supports significant wildlife populations including deer, antelope, and sage grouse (BLM 2013f).

3.2.22.3.1.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Table 3-165 lists the HMAs crossed by the 2-mile-wide study corridors in Segment 2. The Little Colorado HMA overlaps with Segment 1 and is discussed in detail in the previous section.

Table 3-165 Wild Horse Management Areas in Segment 2		
Herd Name	**Herd Management Area Unit**	**Acres[1]**
Little Colorado	WY039	632,328
Green Mountain	WY037	116,677
Antelope Hills	WY031	158,684
Divide Basin	WY002	778,949
Lost Creek	WY035	251,391
White Mountain	WY003	393,073
NOTE: [1]Acres rounded to the nearest whole number		

Green Mountain Herd Management Area

The Green Mountain HMA encompasses 116,667 acres, of which 74,000 acres are BLM-administered lands. Topography in the herd area is generally gently rolling hills and slopes north and south of Green Mountain. Green Mountain itself is quite steep with mountainous terrain and conifer/aspen forests. Elevations range from 6,200 to 9,200 feet with grand vistas of the Red Desert, Sweetwater Rocks, and

Oregon Trail from the higher elevations. Precipitation ranges from 10-14 inches at the lower elevations to 15 to 20 inches at the upper elevations. Most of the precipitation is in the form of snow (BLM 2013e).

The AML for this HMA is 300 horses. A full range of colors is present. Most horses are solid in color, but a noticeable number of tobiano paints are present. The horses range from 11 to 15 hands and 750 to 1,000 pounds mature weight. Health is good with few apparent problems. Domestic cattle and sheep utilize the area in all seasons with summer cattle use predominating. Vegetation around the mountain is dominated by various sage, grass, woodland, and riparian species. The area supports significant wildlife populations of elk, deer, antelope, and moose (BLM 2013e).

Antelope Hills Herd Management Area

The Antelope Hills HMA encompasses 57,000 acres, of which 54,600 are BLM-administered lands. The AML for this HMA is 60-82 adult horses. The area is located approximately 15 miles south/southeast of Atlantic, City, Wyoming. Elevations in the HMA range from 7,100 to 7,250 feet along Cyclone Rim. The HMA is bisected by the CDNST. The area receives 5 to 7 inches of precipitation annually. The dominant vegetation type is sagebrush/grass. Riparian zones are infrequent but very important to wild horses, wildlife, and livestock. The topography ranges from rolling flatlands south of Cyclone Rim, uplifted ridges along Cyclone Rim, and abrupt rocky zones interspersed with rolling lands north of the rim to the Sweetwater River (BLM 2013e).

Great Divide Basin Herd Management Area

The Great Divide Basin HMA encompasses 778,915 acres, of which 562,702 acres are BLM-administered lands. The management area is located 40 miles east of Rock Springs and is in the Rock Springs Field Office. The northern portion of the HMA consists primarily of consolidated public lands with state school sections and small parcels of private land making up the remaining lands. The southern portion is in the checkerboard land ownership area created by the Union Pacific Railroad grant. Topography in the herd area is generally gently rolling hills and slopes with some tall buttes and streams. Elevations range roughly from 6,200 to 8,700 feet. Precipitation ranges from 6 to 10 inches, predominately in the form of snow (BLM 2013d).

The AML for this HMA is 500 horses. Most horses are bay, sorrel, black, brown, paint, buckskin, or gray, but many colors and combinations are present. The Wyoming horses have a diverse background of many domestic horse breeds. They are most closely related to North American gaited breeds such as Rocky Mountain Horse, American Saddlebred, Standardbred, and Morgan. The horses range from 14 to 15.5 hands and weigh up to 1,100 pounds mature weight. The health of the horses is good with no apparent problems.

Domestic cattle and sheep utilize the area lightly in summer and moderately in winter. Vegetation in the HMA is dominated by sagebrush and grass intermixed with greasewood and saltbrush. The area also supports significant wildlife populations including elk, deer, and antelope (BLM 2013d).

Lost Creek Herd Management Area

The Lost Creek HMA encompasses over 251,000 acres, of which 235,000 acres are BLM-administered lands. This HMA is joined on the east by the Stewart Creek HMA, on the north by the Antelope Hills HMA, and on the west by the Divide Basin HMA. The HMA is in the Rawlins Field Office boundary. The HMA lies in the Great Divide Basin, a closed basin out of which no water flows. Some desert playa and vegetated dune areas are interspersed throughout the HMA. Several sensitive desert wetland riparian areas occur throughout the area, including both intermittent and perennial lakes and streams. Elevation ranges from 6,500 to 6,800 feet and the winters are long and severe. Annual precipitation averages a little less than 6 inches (BLM 2013g).

The AML for this HMA is 60 to 82 horses. A full range of colors is present. The present population has been influenced by the routine escape of domestic saddle stock from the surrounding populated areas. The horses range from 14 to 15 hands and 800 to 1,000 pounds mature weight (BLM 2013g).

White Mountain Herd Management Area

The White Mountain HMA encompasses 392,649 acres, of which 240,416 acres are BLM-administered lands. The majority of the HMA consists of checkerboard land ownership in the Union Pacific Railroad grant. The HMA is in the Rock Springs Field Office boundary. Consolidated public lands with state school sections and small parcels of private land make up the remaining lands in the northeast section of the HMA. The HMA is a high plateau that overlooks Rock Springs. Elevations range roughly from 6,300 to 7,900 feet. Precipitation ranges from 6 to 10 inches, predominately in the form of snow. The area is unfenced except for portions of boundary fence and right-of-way boundaries along I-80 and 191 North (BLM 2013k).

The AML for this HMA is 250 horses. A full range of colors is present. This herd has a lot of color in it, many of which are paints. Other colors are bay, sorrel, red roan, black, or gray. The Wyoming horses have a diverse background of many domestic horse breeds. They are most closely related to North American gaited breeds such as Rocky Mountain Horse, American Saddlebred, Standardbred, and Morgan. The horses range from 14 to 15.5 hands and weigh between 750 and 1,100 pounds mature weight. The health of the horses is good (BLM 2013k).

Domestic cattle and sheep utilize the area lightly in the summer and moderately in the winter. Vegetation in the HMA is dominated by sagebrush and grass, with saltbrush, winterfat, and greasewood intermixed. Horses typically use a high amount of grass species, the most favorable being needlegrass, Indian ricegrass, wheatgrass, and Sedges. The area supports significant wildlife populations including elk, deer, and antelope (BLM 2013k).

3.2.22.3.1.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Table 3-166 lists the HMAs crossed by the 2-mile-wide study corridors in Segment 3. Green Mountain HMA is in Segments 2 and 3 and is described in detail in the previous section.

Table 3-166
Wild Horse Management Areas in Segment 3

Herd Name	Herd Management Area Unit	Acres[1]
Muskrat Basin	WY027	193,254
Green Mountain	WY037	116,677

NOTE: [1]Acres rounded to the nearest whole number

Muskrat Basin Herd Management Area

The Muskrat Basin HMA encompasses more than 375,000 acres of land, of which about 90 percent are BLM-administered lands. While the four HMAs are managed with recognized individual populations, there is no geographic separation of the HMAs and the gates between them remain open a significant part of the year. As a result, the horses move regularly among the HMAs, helping to ensure the overall genetic health of the horses (BLM 2013h).

Topography of the area includes high ridges and steep terrain with grand vistas. Beaver Rim, located on the western edge of the HMAs, is a beautiful, high escarpment with amazing views of the Wind River Mountains, Copper Mountains, and Owl Creek Mountains.

Elevations in the HMAs range from 5,300 to 7,200 feet. The area receives 5 to 12 inches of precipitation a year, depending on the elevation, most of it in the form of snow. The AML for these HMAs combined is 320-536 horses. A full range of colors are present. Most horses are solid in color, but a few pintos and blue roans are scattered through the HMA. The horses range from 11 to 15 hands and 750 to 1,000 pounds mature weight. Vegetation is dominated by various sage and grass species. Elk, deer, and antelope inhabit this area (BLM 2013h).

3.2.23 Wildlife

This section addresses terrestrial wildlife species and habitats, including special status species and their habitats that may be affected by the Project. Wildlife management areas are discussed in the Special Designations section. Fish and aquatic species are addressed in the Fish and Aquatic Resources section.

3.2.23.1 Regulatory Framework

Relevant federal and state wildlife regulations, policies, plans, and guidance are summarized below.

3.2.23.1.1 Federal Regulations

- Federal Executive Order 13112: Invasive Species requires federal agencies to prevent the introduction and spread of invasive species and prohibits their authorization of actions that would be likely to cause or promote the introduction or spread of invasive species.
- Federal Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds directs federal agencies to take certain actions to further implement the MBTA (16 U.S.C. 703-711). The federal agencies are directed to develop and implement a Memorandum of Understanding with the USFWS to promote conservation of migratory bird populations.
- The ESA (16 U.S.C. 1531-1544) authorizes the USFWS to protect plant and wildlife species and the habitats on which they depend. It requires federal agencies to ensure that their actions (including permitting) are not likely to jeopardize the continued existence of a listed species or result in the destruction of the species' habitat.
- The BGEPA (16 U.S.C. 668-668d) prohibits the "take" or possession or any commerce of bald (*Haliaeetus leucocephalus*) or golden eagles (*Aquila chrysaetos*). The definition of "take" includes: pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb.
- The MBTA of 1918 (16 U.S.C. 703-712) provides that it is unlawful to pursue, hunt, take, capture, or kill; attempt to take, capture, or kill; possess any migratory bird, part, nest, egg or product, manufactured or not.
- The FLPMA, as amended, consolidates and articulates the BLM and USFS management responsibilities and governs most uses of the federal lands, including authorization to grant or renew rights-of-way. The agencies must make land-use decisions based on principles of multiple use and sustained yield. As such, a grant of right-of-way must be limited to its necessary use and must contain terms and conditions that reflect the agencies' management responsibilities under FLMPA, including minimizing impacts on fish and wildlife habitat.
- BLM Memorandum of Understanding between the BLM and the USFWS to Promote the Conservation of Migratory Birds outlines a collaborative approach to promote the conservation of migratory bird populations and is intended to strengthen migratory bird conservation efforts by identifying and implementing strategies to promote conservation and reduce or eliminate adverse impacts on migratory birds through enhanced collaboration between the BLM and the USFWS, in coordination with state, tribal, and local governments.

- BLM Washington Office IM2012-043 provides interim conservation policies and procedures to the BLM field officials to be applied to ongoing and proposed authorizations and activities that affect the greater sage-grouse (*Centrocerus urophasianus*) and its habitat while the BLM develops and decides how to best incorporate long-term conservation measures into applicable land-use plans.
- BLM Wyoming IM 2013-005 provides guidance for migratory bird conservation policy on Wyoming BLM -administered public lands including the federal mineral estate.
- BLM Wyoming Sage-grouse IM 2012-019 provides guidance to Wyoming BLM field offices on sage-grouse habitat management for proposed activities and resource management planning. It is the policy of Wyoming BLM to manage sage-grouse seasonal habitats and maintain habitat connectivity to support population objectives set by the WGFD.
- BLM Manual 6840 provides BLM policy and direction concerning BLM sensitive species with Wyoming sensitive species administered under IM No. WY 2010-027 establishing the latest Wyoming sensitive species list.
- BLM RMP, RODs, and Approved Management Framework Plans for Wyoming, including Casper (2007), Lander (2014), Pinedale (2008), Rawlins (2008), and Rock Springs (1997) Field Offices, specify regulations and goals for the management of BLM-administered lands and set restrictions to protect fish and wildlife and the habitats on which they depend.
- BLM Wyoming Greater Sage Grouse ARMPA (BLM 2015a) was developed in cooperation with the USFWS, WGFD, State of Wyoming, and cooperating agencies to provide specific goals, objectives, management actions, and required design features for conservation of greater sage-grouse in Wyoming. The ARMPA is consistent with Wyoming's Core Area Strategy and includes additional conservation objectives and restrictions to guide management of BLM-administered lands.
- Platte River Recovery Implementation Program established in 1997, implements actions designed to assist in the conservation and recovery of the target species and their associated habitats along the central and lower Platte River in Nebraska through a basinwide cooperative approach agreed to by the states of Wyoming, Nebraska, and Colorado, as well as the DOI. The Platte River Recovery Implementation Program addresses the adverse impacts of existing and certain new water-related activities on the Platte River target species and associated habitats, and provides ESA compliance for effects on the target species.
- The Upper Colorado Endangered Fish Recovery Program: Under this program, any amount of water removed from the Colorado River system is considered to be a depletion of water, and amounts greater than 0.1 acre-feet per year require formal consultation with the USFWS for downstream impacts on threatened and endangered species.

3.2.23.1.2 State Regulations

- State Executive Order 2015-4: Greater Sage-Grouse Core Area Protection outlines the management of greater sage-grouse including the designation of Core Population Areas in the state of Wyoming.
- Wyoming State Code Section 23-1-101 defines 'wildlife' as all wild mammals, birds, fish, amphibians, reptiles, crustaceans and mollusks, designated by the Wyoming game and fish commission and the Wyoming livestock board in Wyoming.
- Wyoming State Code Section 23-1-103 establishes that all wildlife is the property of the state of Wyoming; and directs the control, propagation, management, protection and regulation of wildlife in Wyoming.

- Wyoming State Code Section 23-1-302 empowers the Wyoming game and fish commission to manage big game hunting seasons, take and areas in Wyoming; and to develop, improve and maintain lands and waters for the management and protection of all wildlife.
- Wyoming State Code Section 23-3-108 states it is a violation to take or intentionally destroy the nest or eggs of any nonpredacious bird in Wyoming. (http://legisweb.state.wy.us/statutes/statutes.aspx?file=titles/Title23/T23CH3.htm)
- Wyoming State Code Section 23-3-101 prohibits the take of eagles.
- Wyoming State Code Section 23-3-102 prohibits the take of any big or trophy game animal or gray wolf where classified as a trophy game animal without the proper license or authority.
- Wyoming State Code Section 23-3-103 prohibits the take of any furbearing animal or game bird without the appropriate license in Wyoming.
- The Wyoming State Wildlife Action Plan 2005 and revised in 2010 is a coordinated, comprehensive conservation strategy designed to maintain the health and diversity of wildlife, including species with low and declining populations in Wyoming.

3.2.23.2 Regional Setting

Most of the study area occurs in the Wyoming Basin Level III Ecoregion. A small area in the southern portion of the study area occurs in the Middle Rockies Level III Ecoregion (Omernik 1987). Segment 1 of the study area is almost entirely in the Wyoming Basin Physiographic Province (Fenneman 1928). Segment 2 of the study area crosses the Green River and the Great Divide basins, which are part of the larger Greater Green River Basin. Segment 3 of the study area is located predominantly in the Wyoming Basin as the Project heads north through the Granite Mountain area before turning east, north of Rattlesnake Hills. A portion of this segment crosses into the southeastern extent of the Wind River Basin.

3.2.23.3 Inventory Methodology

Data on important wildlife species in the study area, including special status species, were obtained from the USFWS, the WGFD, and the WYNDD. Potential habitat information and descriptions for species listed under the ESA in Wyoming were obtained from the USFWS. Big game habitat and migration data was obtained from the WGFD. Data for BLM sensitive species and greater sage-grouse habitat and leks were obtained from the WYNDD.

3.2.23.4 Wildlife Habitat

In general, the study area comprises wildlife communities typical to the Wyoming Basin Level III Ecoregion. The ecoregion has relatively intact wildlife food chains that include large predators, large ungulates (big game), raptors, and smaller sagebrush communities of birds, amphibians, reptiles, and mammals. This ecoregion is a broad arid intermontane basin interrupted by hills and low mountains and dominated by grasslands and shrublands. Nearly surrounded by forest-covered mountains, the region is drier than the Northwestern Great Plains Ecoregion to the northeast and does not have the extensive cover of pinyon-juniper woodland found in the Colorado Plateaus Ecoregion to the south. Much of the region is used for livestock grazing. Habitat in the eastern edge of the ecoregion has more mixed grass prairie. Habitat in the remainder of the ecoregion has Wyoming big sagebrush as the most common shrub with silver and black sagebrush occurring in the lowlands and mountain big sagebrush in the higher elevations. Other less common habitats found in the ecoregion include alluvial flats and playas, foothill shrublands and low mountains with juniper and mountain mahogany, sand dunes, and riparian areas that include irrigated wet meadows (Omernik 1987).

The vegetation communities described in Section 3.2.18 have been adopted to characterize the general wildlife habitat found in the study area. In each segment of the study area, vegetative cover includes the following communities: Alpine, Aspen, Barren/Sparsely Vegetated (less than 10 percent cover), Big Sagebrush, Grassland, Limber pine-juniper, Montane Forest, Mountain Shrub, Riparian, Shrub/Shrub Steppe, and Wetlands. Big Sagebrush and Shrub/Shrub Steppe are the most abundant vegetation communities in the study area.

3.2.23.5 Special Status Species

This section includes BLM sensitive species, ESA-listed species, and Wyoming Game and Fish Species in Greatest Conservation Need with the potential to occur in the study area.

3.2.23.5.1 Amphibians and Reptiles

Per the State Wildlife Action Plan (WGFD 2010a) there are 12 species of amphibians and 24 species of reptiles in Wyoming. Based on available data, only two special status amphibian species occur in the study area, the Great Basin spadefoot toad (*Spea intermontana*) and the northern leopard frog (*Lithobates pipiens*), both BLM sensitive species and state Species of Greatest Conservation Need. The Great Basin spadefoot toad is a habitat generalist in a landscape where its habitat is scarce. Ephemeral or permanent stands of water are required for breeding. The species distribution in Wyoming is poorly understood. The northern leopard frog was once widely distributed but has been declining throughout its range. It occurs in or near permanent water sources in a wide range of habitat types. There are no other WGFD Conservation Need, BLM-sensitive, or ESA-listed amphibians or reptiles in the Project segment study areas.

3.2.23.5.2 Birds

Special status bird species and other raptors that may occur in the study area are listed in Table 3-167. Except for greater sage-grouse, all species are protected under the MBTA. In addition, bald and golden eagles are protected under the BGEPA. Modeled habitat of BLM non-raptorial sensitive bird species crossed by the Project is presented in Table 3-168 Raptor nests within 1 mile of alternative routes are displayed in Table 3-169 and greater sage-grouse habitat crossed by the alternative routes and within 4 miles of the alternative route is displayed in Table 3-171. Each of the special status bird species known to occur in the Project area is discussed below.

Table 3-167
Special Status Birds and Other Raptor Species that May Occur in the Study Area

Common Name	Scientific Name	Regulatory Status	Segment 1	Segment 2	Segment 3
American kestrel	*Falco sparverius*	-	✓	✓	✓
Bald eagle	*Haliaeetus leucocephalus*	SS, SGCN	✓	✓	✓
Brewer's sparrow	*Spizella breweri*	SS, SGCN	✓	✓	✓
Burrowing owl	*Athene cunicularia*	SS, SGCN	✓	✓	✓
Ferruginous hawk	*Buteo regalis*	SS, SGCN	✓	✓	✓
Golden eagle	*Aquila chrysaetos*	SS	✓	✓	✓
Greater sage-grouse	*Centrocercus urophasianus*	SS, SGCN	✓	✓	✓
Great horned owl	*Bubo virginianus*	-	✓	✓	✓
Loggerhead shrike	*Lanius ludovicianus*	SS	✓	✓	✓
Long-billed curlew	*Numenius americanus*	SS, SGCN	✓	✓	
Merlin	*Falco columbarius*	SS, SGCN		✓	✓
Mountain plover	*Charadrius montanus*	SS, SGCN	✓	✓	✓
Northern goshawk	*Accipiter gentilis*	SS, SGCN	✓	✓	
Northern harrier	*Circus cyaneus*	-	✓	✓	✓

Table 3-167
Special Status Birds and Other Raptor Species that May Occur in the Study Area

Common Name	Scientific Name	Regulatory Status	Segment 1	Segment 2	Segment 3
Osprey	*Pandion haliaeetus*	SS	✓		
Peregrine falcon	*Falco peregrinus*	SS, SGCN	✓	✓	
Prairie falcon	*Falco peregrinus*	-	✓	✓	✓
Red-tailed hawk	*Buteo jamaicensis*	-	✓	✓	✓
Sage thrasher	*Oreoscoptes montanus*	SS, SGCN	✓	✓	✓
Sagebrush sparrow	*Artemisiospiza nevadensis*	SS	✓	✓	✓
Swainson's hawk	*Buteo swainsoni*	-	✓	✓	✓
Trumpeter swan	*Cygnus buccinator*	SS, SGCN	✓	✓	
Yellow-billed cuckoo	*Coccyzygus americanus*	T, CH, SS, SGCN	✓		

NOTES:
C = Federal ESA Candidate Species
T = Federal ESA Threatened
CH = designated Critical Habitat listed under the ESA is present in the area for this species
SS = BLM Sensitive Species
SGCN = WGFD Species in Greatest Conservation Need

Table 3-168
Bureau of Land Management Non-Raptorial Sensitive Migratory Bird Inventory Data

Alternative Route	Total Miles	Miles Crossed					
		Loggerhead Shrike	Long-billed Curlew	Mountain Plover	Sagebrush Sparrow	Sage Thrasher	Brewer's Sparrow[1]
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant							
1A: Proposed Action	30.4	9.8	19.3	6.8	29.4	20.9	0.0
1A Variation: Dry Basin Draw	30.7	9.2	19.6	6.8	29.7	21.2	0.0
1B: Dry Piney	34.5	6.1	23.2	3.8	33.5	25.0	0.0
1C: Figure Four	38.5	7.9	24.4	7.6	37.0	28.6	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect							
2A: Proposed Action	129.1	0.0	11.6	92.2	129.1	0.0	0.0
2B: Southern Route	136.2	0.0	8.9	114.8	136.2	0.0	0.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect							
3A: Proposed Action	83.2	0.6	7.4	52.8	80.1	0.0	0.0
3B: Lost Creek to Lost Cabin	73.0	0.6	0.0	52.9	69.3	0.0	0.0
3C: Lost Creek to Highway 20/26	101.4	0.6	2.3	72.9	90.0	0.0	0.0

NOTE: [1]Brewer's sparrow habitat is known to occur in all segments, but modeled habitat would be crossed by alternative routes in such low quantities that it was not detected in analysis.

Table 3-169
Raptor Inventory Data

Alternative Route	Total Miles	Number of Known Nests within 1 Mile of Centerline								
		American Kestrel	Burrowing Owl	Ferruginous Hawk	Golden Eagle	Great Horned Owl	Northern Harrier	Prairie Falcon	Red-tailed Hawk	Swainson's Hawk
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant										
1A: Proposed Action	30.4	0	0	1	2	0	0	2	6	0
1A Variation: Dry Basin Draw	30.7	0	0	1	2	0	0	2	6	0
1B: Dry Piney	34.5	0	0	1	2	0	0	2	6	0
1C: Figure Four	38.5	0	0	1	3	0	0	4	6	0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect										
2A: Proposed Action	129.1	1	7	13[1]	1	1	0	1	1	1
2B: Southern Route	136.2	1	2	9[1]	2	1	0	1	2	0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect										
3A: Proposed Action	83.2	3	1	9	5	1	0	3	5	1
3B: Lost Creek to Lost Cabin	73.0	5	5	2	0	4	1	1	7	2
3C: Lost Creek to Highway 20/26	101.4	3	4	14	1	1	1	1	5	3

NOTE: [1]Includes 2 artificial nests

Bald Eagle

In Wyoming, bald eagles primarily nest in cottonwood-dominated riparian areas. Individuals nest in large trees or snags with sturdy branches in areas that provide adequate food (fish and carrion) and access to open water. During non-breeding periods, especially winter, bald eagles are relatively social and roost communally in sheltered stands of trees. Wintering areas are commonly associated with open water, though other habitats can be used if food resources such as carrion are readily available. In the lower 48 states, bald eagles generally avoid areas with nearby human activity and development. GAP vegetative communities commonly used as habitat by the bald eagle include Riparian and Wetlands for nesting areas. Bald eagles use all vegetative communities for foraging with a strong affinity for open water found with fish species. WYNDD modeled bald eagle wintering and breeding habitat is crossed by all alternative routes in all three Project segments. (Refer to Table 4-143). No bald eagle nests are known to occur within 1 mile of any alternative routes, but one bald eagle roost area occurs in the study area.

Brewer's Sparrow

The summer breeding range for this species is sagebrush habitat in the western U.S. Its wintering range is desert scrub in the southwestern U.S. and Central America. Nesting occurs in sagebrush where females have access the protein rich insects (Hansley and Beauvais 2004a). GAP vegetative communities commonly used as habitat by the Brewer's sparrow include Barren/sparsely Vegetated (less than 10 percent cover), Big Sagebrush, Grassland, and Shrub/Shrub Steppe. WYNDD modeled Brewer's sparrow breeding habitat is not crossed by any alternative route in any Project segment (Table 3-168).

Burrowing Owl

This ground-dwelling owl occurs in grasslands and sagebrush habitat where it is often associated with prairie dog colonies (Lantz et al. 2004). Burrowing owls prey on insects and small mammals primarily during daylight hours. Due to the widespread eradication of prairie dogs and land-use changes, this species is declining throughout the western U.S. GAP vegetative communities commonly used as habitat by burrowing owls include Barren/Sparsely Vegetated (less than 10 percent cover), Big Sagebrush, Grassland, Shrub/Shrub Steppe, and Wetlands. Burrowing owls are known to occur in the study area. Burrowing owls are known to nest within 1 mile of all alternative routes in Segments 2 and 3 (Table 3-169).

Ferruginous Hawk

This raptor occurs in arid and open grassland, shrub steppe, and desert habitats in western North America. Wintering occurs in grasslands in the southwestern U.S. and northern Mexico. The ferruginous hawk is a prairie dog specialist that also will prey on other small mammals, birds, reptiles, and large invertebrates (Travsky and Beauvais 2005). Due to the widespread eradication of prairie dogs, this species is declining throughout its range. GAP vegetative communities commonly used as habitat by the ferruginous hawk include Barren/Sparsely Vegetated (less than 10 percent cover), Big Sagebrush, Grassland, Shrub/Shrub Steppe, and Wetlands. Ferruginous hawks are known to nest within 1 mile of all alternative routes in all three Project segments (Table 3-169).

Golden Eagle

The golden eagle is a large, circumboreal raptor that uses suitable rocky cliffs and ridges for nesting sites (Kochert et al. 2002). The breeding season typically begins in early spring (Palmer 1988). The average territory size is approximately 20 to 55 square miles. The species primarily preys on small mammals but also may eat a variety of other prey including carrion. Golden eagles in Wyoming are year-round residents. GAP vegetative communities commonly used as habitat by the golden eagle include Alpine, Aspen, Barren/Sparsely Vegetated (less than 10 percent cover), Big Sagebrush, Grassland, Limber pine-juniper, Montane Forest, Mountain Shrub, Riparian, Shrub/Shrub Steppe, and Wetlands for foraging. Nesting habitat is typically on rock ridge rock faces and cliffs. WYNDD modeled golden eagle breeding habitat is crossed by all alternative routes in all three Project segments (Refer to Table 4-143). Golden eagles are known to nest within 1 mile of all alternative routes in all three Project segments, except for Alternative 3B: Lost Creek to Lost Cabin (Table 3-169).

Greater Sage-Grouse

In September of 2015, the USFWS removed the greater sage-grouse from consideration as threatened or endangered under the ESA. This was the result of candidate listing in 2010 prompting federal, state, and local governments, as well as other stakeholders, to take actions to avoid a listing and enable a successful recovery trend for the species. In Wyoming, this included establishment of the Wyoming State Executive Order establishing core habitat areas and the BLM and the USFS ARMPAs.

In Wyoming, greater sage-grouse inhabit upland sagebrush grasslands, foothills, and mountain valleys. This species occupies different habitat types during the year depending on the season, weather, and nutritional requirements. Important habitat areas for sage-grouse are leks, brood rearing areas, and wintering areas. Leks are defined as areas where males gather, display, and breed. Nesting habitat for greater sage-grouse typically occurs in areas within a 5-mile radius from the leks. Vegetation communities used as habitat by greater sage-grouse include Barren/Sparsely Vegetated (less than 10 percent cover), Big Sagebrush, Grassland, Riparian, Shrub/Shrub Steppe, and Wetlands. Greater sage-grouse also use agricultural land, particularly irrigated hay meadows located in riparian settings.

As its name implies, the greater sage-grouse is most common in sagebrush dominated habitats. It is an indicator species of ecosystem and biological community integrity and health. With extensive habitat, stable populations, and its location in the geographic core of the species range, Wyoming is critical to the long-term viability of the greater sage-grouse. Greater sage-grouse ARMPA habitat classifications used in this analysis include PHMA and GHMA. GHMA is further classified as either GHMA with occupied leks or without occupied leks. PHMA also includes a subset of areas of BLM-designated SFA. SFAs are defined as important landscape blocks with high greater sage-grouse breeding densities and high-quality sagebrush. SFAs are considered the highest value habitat for maintaining the species and its habitat.

All Project alternative routes cross designated greater sage-grouse habitat (Table 3-170). All the PHMA and GHMA crossed by the Project include occupied, unoccupied, and status-unknown leks; the number of leks within 4 miles of the alternative routes is displayed in Table 3-171.

Table 3-170
Priority Habitat Management Areas, General Habitat Management Areas, Sagebrush Focal Areas, and No Surface Occupancy Areas Crossed by Alternative Pipeline Routes

Alternative Route	Total Miles	PHMAs	GHMAs	Sagebrush Focal Areas – South Central Wyoming	No Surface Occupancy Areas for Leks in PHMAs	No Surface Occupancy Areas for Leks in GHMAs
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant						
1A: Proposed Action	30.4	0.0	30.4	0.0	0.0	0.4
1A: Variation: Dry Basin Draw	30.7	0.0	30.7	0.0	0.0	0.4
1B: Dry Piney	34.5	0.0	34.5	0.0	0.0	0.0
1C: Figure Four	38.5	0.0	38.5	0.0	0.0	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect						
2A: Proposed Action	129.1	83.7	129.1	35.1	4.6	0.8
2B: Southern Route	136.2	78.1	136.2	38.3	2.3	0.3
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect						
3A: Proposed Action	83.2	45.7	83.2	0.0	0.9	0.0
3B: Lost Creek to Lost Cabin	73.0	38.1	73.0	0.0	0.0	0.0
3C: Lost Creek to Highway 20/26	101.4	49.9	101.4	0.0	0.0	0.0

Table 3-171
Greater Sage-Grouse Habitat Management Areas and Leks

Alternative Route	Total Miles	Resource Inventory within 4 Miles of Centerline				
		Priority Habitat Management Areas (Acres)	General Habitat Management Areas (Acres)	Occupied Leks	Unoccupied Leks	Undetermined Leks
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant						
1A: Proposed Action	30.4	0	171,022	12	1	0
1A Variation: Dry Basin Draw	30.7	0	172,117	12	1	0

Table 3-171
Greater Sage-Grouse Habitat Management Areas and Leks

Alternative Route	Total Miles	Resource Inventory within 4 Miles of Centerline				
		Priority Habitat Management Areas (Acres)	General Habitat Management Areas (Acres)	Occupied Leks	Unoccupied Leks	Undetermined Leks
1B: Dry Piney	34.5	0	190,899	11	1	0
1C: Figure Four	38.5	0	209,984	12	1	0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect						
2A: Proposed Action	129.1	424,257	677,533	37	12	1
2B: Southern Route	136.2	397,455	722,046	33	14	0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect						
3A: Proposed Action	83.2	326,382	448,542	24	0	0
3B: Lost Creek to Lost Cabin	73.0	237,129	396,677	14	0	0
3C: Lost Creek to Highway 20/26	101.4	343,582	539,659	17	0	0

Loggerhead Shrike

This species is widespread throughout North America in open country with available insect prey and perching structures. Breeding season is typically from February to the end of May. During warmer months, the principle food of the loggerhead strike is insects, shifting toward small vertebrates during colder months (Keinath and Schneider 2005). The loggerhead shrike is uncommon in many areas while being abundant in others. Overall declines are attributed to habitat loss and land-use changes. North American birds will migrate southward below the permanent snow cover in some years. GAP vegetative communities commonly used as habitat by the loggerhead shrike include Barren/Sparsely Vegetated (less than 10 percent cover), Big Sagebrush, Grassland, Limber pine-juniper, Mountain Shrub, Riparian, Shrub/Shrub Steppe, and Wetlands. WYNDD modeled loggerhead shrike breeding habitat is crossed by all alternative routes in Segments 1 and 3 (Table 3-168).

Long-billed Curlew

This species typically winters and breeds in the Great Plains, Great Basin, and intermontane valleys of the western U.S. and southwestern Canada. Breeding season begins in late April to early May in grasslands and irrigated meadows. Food resources consist of invertebrates, some tidal mudflat vertebrates, and burrowing earthworms (Dark-Smiley and Keinath 2004). The long-billed curlew is uncommon and limited by suitable habitat throughout its range. GAP vegetative communities commonly used as habitat by the long billed curlew include Riparian and Wetlands. WYNDD modeled long-billed curlew breeding habitat is crossed by all alternative routes in all three Project segments, except for Alternative 3B: Lost Creek to Lost Cabin (Table 3-168).

Merlin

The summer breeding range of this medium-sized falcon includes the northern forests of North America. Wintering occurs in the southern U.S. and northern South America. Preferred habitat includes open areas in addition to the presences of forest cover. Food resources are small- to medium-sized birds, small rodents and reptiles, and amphibians (BLM 2014a). GAP vegetative communities commonly used as habitat by the merlin include Alpine, Aspen, Barren/Sparsely Vegetated (less than 10 percent cover), Big

Sagebrush, Grassland, Limber pine-juniper, Montane Forest, Mountain Shrub, Riparian, Shrub/Shrub Steppe, and Wetlands. No merlin nests are known to occur within 1 mile of any alternative routes.

Mountain Plover

This shorebird species prefers flat topography in upland habitats in the western Great Plains. This species associates with prairie dog towns during the breeding season. Wyoming is host to approximately 25 percent of the North American breeding population. This species is insectivorous, consuming ground dwelling or perched invertebrates (Smith and Keinath 2004a). The widespread decline of prairie dogs has resulted in a correlating decline of mountain plovers throughout the range. GAP vegetative communities commonly used as habitat by the mountain plover include Barren/Sparsely Vegetated (less than 10 percent cover), Big Sagebrush, Grassland, and Shrub/Shrub Steppe. WYNDD modeled mountain plover breeding habitat is crossed by all alternative routes in all three Project segments (Table 3-168).

Northern Goshawk

The summer breeding range of the northern goshawk is in the coniferous forests of North America including the higher elevations of the West. Wintering occurs in the southern U.S. through Central America. Goshawks prey on birds and small mammals (Smith and Keinath 2004b). GAP vegetative communities commonly used as habitat by the northern goshawk include Alpine, Aspen, Barren/Sparsely Vegetated (less than 10 percent cover), Big Sagebrush, Grassland, Limber pine-juniper, Montane Forest, Mountain Shrub, Riparian, Shrub/Shrub Steppe, and Wetlands. Extensive patches of open habitat use are contingent on proximity to the forested communities. No goshawk nests are known to occur within 1 mile of any alternative route.

Osprey

This raptor has a global range and shows a strong affinity to water in its summer breeding habitat. Its primary prey is fish. Its breeding season begins in late March or early April. Osprey will occasionally prey on frogs, snakes, ducks, birds, and small mammals (Tesky 1993). In Wyoming, breeding pairs typically nest in large trees and man-made structures near larger waterbodies. GAP vegetative communities commonly used as habitat by the osprey are Riparian and Wetlands. The limiting factor for habitat use for nesting is proximity to open water with fish populations. No osprey nests are known to occur within 1 mile of any alternative route.

Peregrine Falcon

This falcon species has recovered from the brink of extinction in the early 1970s and can now be found throughout North America in mountain ranges, river valleys, coastlines, and urban habitats. Nesting occurs on cliffs, tall buildings, and bridges. Peregrines specialize in taking bird prey in flight (USFWS 2006). Due to limited availability of nesting sites, peregrine falcons are considered less common species. GAP vegetative communities commonly used as habitat by the peregrine falcon for foraging include Alpine, Aspen, Barren/Sparsely Vegetated (less than 10 percent cover), Big Sagebrush, Grassland, Limber pine-juniper, Montane Forest, Mountain Shrub, Riparian, Shrub/Shrub Steppe, and Wetlands. The limiting factor for habitat use by the peregrine falcon is proximity of these communities to rocky outcrops and cliffs for nesting and roosting. No peregrine falcon nests are known to occur within 1 mile of any alternative routes.

Sage Thrasher

This species is a sagebrush steppe obligate. Its range includes western North America. It requires large expanses of sagebrush steppe for breeding. Nesting commonly occurs in or under big sagebrush. Its diet is primarily insectivorous, consuming a small amount of plant materials, berries, and small fruits as well. Its winter diet includes arthropods, seeds, and fruits (Buseck et al. 2004). GAP vegetative communities

commonly used as habitat by the sage thrasher include Big Sagebrush, Grassland, Limber pine-juniper, Mountain Shrub, and Shrub/Shrub Steppe. WYNDD modeled sage thrasher breeding habitat is crossed by all alternative routes in Segment 1 (Table 3-168).

Sagebrush Sparrow

This species is common in western North America in landscapes dominated by large, undisturbed tracts of dense sagebrush. Winter habitat is arid, open plains. Prey is primarily insects, spiders, seeds, small fruits, and succulent vegetation (Hansley and Beauvais 2004b). GAP vegetative communities commonly used as habitat by the sagebrush sparrow include Barren/Sparsely Vegetated (less than 10 percent cover), Big Sagebrush, and Shrub/Shrub Steppe. WYNDD modeled sage sparrow breeding habitat is crossed by all alternative routes in all three Project segments (Table 3-168).

Trumpeter Swan

There are three management populations of this native swan, which was once near extinction in the 1960s: a Pacific Coast population of birds that nest in Alaska and winter in Canada and the northwestern U.S.; the Rocky Mountain population that winter in Montana, Idaho, and Wyoming including the Project area; and the Interior population that nest east of the Rocky Mountain population. Nesting habitat is clear, quiet, and ponded waterbodies with static levels. Winter habitat is open water bordered by level and open terrain. This herbivorous species prefers freshwater plants like wild celery and pondweed, but will eat grain, grass, insects, snails, and other small invertebrates (Travsky and Beauvais 2004). There are no GAP vegetative communities commonly used as habitat by the trumpeter swans except Wetlands. Trumpeter swans require open waterbodies and lakes and could use the study area during fall and spring migration.

Yellow-billed Cuckoo

The distinct population segment of the yellow-billed cuckoo west of the Continental Divide is listed as threatened under the ESA. In Wyoming, the secretive yellow-billed cuckoo is dependent on large areas of woody, riparian vegetation that combine a dense shrubby understory for nesting and a cottonwood overstory for foraging. Destruction, degradation, and fragmentation of wooded, riparian habitats are continuing threats to yellow-billed cuckoos in Wyoming. All alternative routes in Segment 1 cross riparian habitat occurring in the mapped USFWS AOI for yellow-billed cuckoo. The area has not been surveyed either for habitat suitability or for the presence of yellow-billed cuckoo.

3.2.23.5.3 Mammals

Special status mammal species with potential to occur in the study area are listed in (Table 3-172). Miles of habitat crossed by each alternative route for BLM sensitive mammal species is presented in Table 3-173.

Table 3-172
Special Status Mammal Species that May Occur in the Study Area

Common Name	Scientific Name	Regulatory Status	Segment 1	Segment 2	Segment 3
Canada lynx	*Lynx canadensis*	T, SGCN	✓		
Fringed myotis	*Myotis thysanodes*	SS, SGCN	✓	✓	✓
Long-eared myotis	*Myotis evotis*	SS, SGCN	✓	✓	✓
Pygmy rabbit	*Brachylagus idahoensis*	SS, SGCN	✓	✓	✓
Townsend's big-eared bat	*Corynorhinus townsendii*	SS	✓	✓	✓
White-tailed prairie dog	*Cynomys leucurus*	SS	✓	✓	✓
Wyoming pocket gopher	*Thomomys clusius*	SS, SGCN		✓	✓

NOTES: T = Federal ESA Threatened Species; SS = BLM Sensitive Species; SGCN = WGFD Species in Greatest Conservation Need

Table 3-173
Bureau of Land Management Sensitive Mammal Inventory Data

Alternative Route	Total Miles	Miles Crossed					
		Fringed Myotis	Long-Eared Myotis	Pygmy Rabbit	Townsend's Big-Eared Bat	White-tailed Prairie Dog	Wyoming Pocket Gopher
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant							
1A: Proposed Action	30.4	0.0	6.0	28.3	0.0	13.2	0.0
1A Variation: Dry Basin Draw	30.7	0.0	6.0	28.6	0.0	14.2	0.0
1B: Dry Piney	34.5	0.0	5.8	32.4	0.0	8.7	0.0
1C: Figure Four	38.5	0.0	5.7	36.4	0.0	14.0	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect							
2A: Proposed Action	129.1	0.0	14.1	118.9	0.0	125.1	50.0
2B: Southern Route	136.2	0.0	8.3	113.6	0.0	131.0	49.3
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect							
3A: Proposed Action	83.2	0.0	0.3	23.6	34.9	83.2	4.9
3B: Lost Creek to Lost Cabin	73.0	0.0	0.3	23.0	20.7	73.0	4.9
3C: Lost Creek to Highway 20/26	101.4	0.0	0.3	23.0	20.6	101.4	4.9

Canada Lynx

This federally threatened cat species' range in North America includes subalpine/coniferous forests of mixed age and structural classes. Primarily occurring in Canada, its range extends into the northern U.S. and southward into the Rocky Mountain at elevations above 7,000 feet. The Canada lynx is a snowshoe hare prey specialist. Lynx population levels and dispersal typically tracks the availability of hares (USFWS 2015c). GAP vegetative communities commonly used as habitat by the Canada lynx include Alpine, Aspen, Montane Forest, and Wetlands. Segment 1 alternative routes are in the USFWS mapped AOI for Canada lynx. However, Canada lynx are primarily found in high-elevation coniferous forest and the Project does not cross any areas known or likely to be occupied by resident Canada lynx.

Fringed Myotis

This western bat species occurs from southern Canada and through southern Mexico in oak, pinyon, and juniper woodlands as well as deserts and grassland habitats. The species will roost and nest in trees and winter in caves or mine shafts. Territory size is extremely variable and not widely known for this species. Prey is primarily beetles and moths (Keinath 2003). GAP vegetative communities commonly used as habitat by the fringed myotis include Alpine, Aspen, Barren/Sparsely Vegetated (less than 10 percent cover), Big Sagebrush, Grassland, Limber pine-juniper, Montane Forest, Mountain Shrub, Riparian, Shrub/Shrub Steppe, and Wetlands. The Project does not cross WYNDD-mapped habitat for fringed myotis in any of the three segments (Table 3-173).

Long-Eared Myotis

The range for this bat species includes most of western North America. Habitats include grasslands, conifer forests, humid coastal forests, and montane forests. The species will roost and nest in trees and winter in caves or mine shafts. Prey includes insects, primarily moths and beetles (Buseck and Keinath

2004). GAP vegetative communities commonly used as habitat by the long eared myotis includes Alpine, Aspen, Barren/Sparsely Vegetated (less than 10 percent cover), Big Sagebrush, Grassland, Limber pine-juniper, Montane Forest, Mountain Shrub, Riparian, Shrub/Shrub Steppe, and Wetlands. WYNDD modeled long-eared myotis habitat is crossed by all alternative routes in all three Project segments (Table 3-173).

Pygmy Rabbit

This species is endemic to sagebrush habitats in the Great Basin and intermountain areas. The pygmy rabbit typically occupies tall and dense sagebrush habitats with deep, friable soils for digging its burrows. Food resources are primarily big sagebrush, but during the summer and early fall grasses, rabbitbrush, gooseberries and currants also are consumed (Keinath and McGee 2004). GAP vegetative communities commonly used as habitat by the pygmy rabbit include Barren/Sparsely Vegetated (less than 10 percent cover), Big Sagebrush, Grassland, Limber pine-juniper, Riparian, Shrub/Shrub Steppe, and Wetlands. WYNDD modeled pygmy rabbit habitat is crossed by all alternative routes in all three Project segments (Table 3-173). Pygmy rabbits are also known to occur adjacent to each alternative route in all three segments.

Townsend's Big-Eared Bat

The range for this species includes most of western North America; however, it is locally limited by availability of suitable roosting habitat (spacious cavern-like structures). Foraging habitat is along the edges of forested habitat, heavily vegetated stream corridors, and open areas near wooded habitat. Caves and abandoned mines are used as summer roosts and hibernacula in the fall. Mating occurs in the fall in the hibernacula and young are born in late May to mid-July. Food resources are primarily moths and beetles (Gruver and Keinath 2003). GAP vegetative communities commonly used as habitat by the Townsend's big-eared bat include Alpine, Aspen, Barren/Sparsely Vegetated (less than 10 percent cover), Big Sagebrush, Grassland, Limber pine-juniper, Montane Forest, Mountain Shrub, Riparian, Shrub/Shrub Steppe, and Wetlands. WYNDD modeled Townsend's big-eared habitat is crossed by all alternative routes in Segment 3 (Table 3-173).

White-tailed Prairie Dog

This species range includes shrub steppe and grasslands in cool intermountain basins in Wyoming, Colorado, Utah, and Montana. During winter months, this species will hibernate until the first individuals appear in February. Overall colony activity starts to decline in July. Breeding occurs in late March and early April; the young are nursed until June. Food resources include grasses, forbs, shrubs, cacti, seeds, and roots. Animal matter such as insects and carrion also are consumed (Keinath 2004). GAP vegetative communities commonly used as habitat by the white-tailed prairie dog include Barren/Sparsely Vegetated (less than 10 percent cover), Big Sagebrush, Grassland, and Shrub/Shrub Steppe. WYNDD modeled white-tailed prairie dog habitat is crossed by all alternative routes in all three Project segments (Table 3-173).

Wyoming Pocket Gopher

This species inhabits the western U.S. Its preferred habitat is well-drained, gravelly soils on ridge tops. This species excavates and resides below ground burrow systems and underground tunnels. Foraging habitats are usually in proximity or connected to burrows. Breeding occurs from May to June. Food resources are primarily forbs and grasses, but while underground the species will consume roots and tubers (Beauvais and Dark-Smiley 2005). GAP vegetative communities commonly used as habitat by the Wyoming pocket gopher include Big Sagebrush, Grassland, and Shrub/Shrub Steppe. WYNDD modeled Wyoming pocket gopher habitat is crossed by all alternative routes in Segments 2 and 3 (Table 3-173). Known populations of Wyoming pocket gopher occur primarily south of the Project (Keinath and Beauvais 2006).

3.2.23.5.4 Big Game

Big game management is implemented statewide by the WGFD who cooperatively manage these species with the BLM and USFS on federal land surface. Elk, mule deer, and pronghorn antelope are known for using distinct seasonal habitats that may require local or regional scale migration. As a result, the WGFD has defined and mapped big game seasonal ranges and annual migration patterns throughout the state (Table 3-174). The WGFD also defines and maps big game parturition areas where calving occurs.

Table 3-174
Seasonal Wildlife Ranges and Definitions

Seasonal Range Type	Symbol	Definition
Crucial (Crucial Winter and Crucial Winter/Yearlong)	CRU (CRUWIN, CRUWYL)	Those habitat components that are the determining factor in a population's ability to maintain and reproduce itself at a certain level over the long-term.
Severe Winter Relief	SWR	A documented range that may or may not be defined as a crucial range as defined above. It is used only in occasional extreme winters.
Spring/Summer/Fall	SSF	A population or portion of a population of animals that use available habitat sites within this range from the end of the previous winter to the onset of persistent winter conditions (variable but usually between May 1 and Nov. 30) (May 1 – November 14, adopted by WGFD in 2004).
Winter	WIN	A population or portion of a population of animals that use suitable habitat sites within this range annually, in substantial numbers only during the winter period from Dec. 1 – April 30 (November 15 – April 30, adopted by WGFD in 2004).
Winter/Yearlong	WYL	A portion of a population of animals that make general use of suitable habitat sites within this range on an annual basis, but during the winter months (commonly between Dec. 1 and April 30), there is a significant influx of animals from other seasonal ranges (November 15 – April 30, adopted by WGFD in 2004).
Yearlong	YRL	A population or portion of a population of animals that makes general use of the suitable documented habitat within the range on a year-round basis. Exception – occasionally, under severe conditions (extremely severe winters, drought) animals may leave the area.
Outside Area	OUT	Areas that do not contain enough animals to be important habitat or are of limited importance to a species.

SOURCE: Wyoming Chapter of the Wildlife Society 2006

Table 3-175 includes the WGFD big game herd management units crossed by each alternative route.

Table 3-175
Herd Management Units

Alternative Route	Antelope	Elk	Mule Deer
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant			
1A: Proposed Action	Sublette	Piney	Sublette; Wyoming Range
1A Variation: Dry Basin Draw	Sublette	Piney; Pinedale	Sublette; Wyoming Range
1B: Dry Piney	Sublette	Piney; Pinedale	Sublette; Wyoming Range
1C: Figure Four	Sublette	Piney; Pinedale	Sublette; Wyoming Range
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect			
2A: Proposed Action	Sublette; Red Desert	Green Mountain; Pinedale; South Wind River; Steamboat	South Wind River; Sublette; Sweetwater
2B: Southern Route	Sublette; Red Desert	Green Mountain; Pinedale; South Wind River; Steamboat	South Wind River; Sublette; Sweetwater
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect			
3A: Proposed Action	Beaver Rim; Rattlesnake; Red Desert	Green Mountain; Rattlesnake	Beaver Rim; Rattlesnake; Sweetwater
3B: Lost Creek to Lost Cabin	Badwater; Beaver Rim; Red Desert	Green Mountain; South Bighorn	Beaver Rim; Southwest Bighorn; Sweetwater
3C: Lost Creek to Highway 20/26	Badwater; Beaver Rim; North Natrona; Rattlesnake; Red Desert	Green Mountain; Rattlesnake; South Bighorn	Muskrat; North Natrona; Rattlesnake; Badwater; Green Mountain; Sweetwater Rocks

Big game species present in the study area include Rocky Mountain elk (*Cervus canadensis*), pronghorn antelope (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), and moose (*Alces alces*). These species are large herbivores with complex life histories. Because of the effects of topography, big game in Wyoming use different habitats seasonally based on elevation and location. In general, higher elevations where moisture and, consequently, forage is higher are used in the summer for foraging and calving (parturition). Lower elevations with moderate weather conditions and where forage is more reliable and available are used in the winter.

Rocky Mountain elk are a herding and grazing species with complex, seasonal habitat requirements. Seasonal changes in diet affect seasonal changes in habitat use. Elk habitat includes all GAP vegetation communities in the study area. Elk habitat in the study area is most commonly found in Alpine, Aspen, Big Sagebrush, Grassland, Limber Pine-juniper, Montane Forest, Mountain Shrub, Riparian, and Shrub/Shrub Steppe GAP vegetation communities. Elk seasonal ranges crossed by each alternative route are presented in Table 3-176.

Pronghorn antelope can be solitary or herding browsers and are typically found in drier habitat than elk. They primarily use grassland and sagebrush communities. Pronghorn antelope will occur in higher elevations as well, but are rarely documented above tree line or in denser forested areas. Pronghorn antelope habitat in the study area is most commonly associated with Barren/Sparsely Vegetated (less than 10 percent cover), Big Sagebrush, Grassland, Riparian, and Shrub/Shrub Steppe GAP vegetation communities. Pronghorn antelope seasonal ranges crossed by each alternative route are presented in Table 3-176.

Mule deer can be solitary or herding browsers. Mule deer favor open habitats with little to no dense forest cover. Mule deer also are present in open woodlands where there is adequate grass and herbaceous ground cover. They occur at higher elevations but are most common in Wyoming's basins and foothills.

Project area mule deer habitat is most commonly associated with Alpine, Aspen, Big Sagebrush, Grassland, Limber Pine-Juniper, Mountain Shrub, Riparian, and Shrub/Shrub Steppe GAP vegetation communities. Mule deer seasonal ranges crossed by each alternative route are presented in Table 3-176.

Moose are a solitary browsing species known to have large home ranges and the ability to disperse far beyond a home range. In Wyoming, moose maintain a stronger affinity to the higher elevations and mountain ranges where they will descend into the nearby basins, especially in winter. Moose also have a strong affinity to water, where they forage on aquatic plants and riparian vegetation. In the basins, moose are most commonly observed in riparian areas of streams and rivers. Moose habitat in the study area is most commonly found in Alpine, Aspen, Limber Pine-Juniper, Montane Forest, Mountain Shrub, Riparian, Wetlands, and Shrub/Shrub Steppe GAP vegetation communities. Moose seasonal ranges crossed by each alternative route are presented in Table 3-176.

Big game use migration routes in the study area to migrate between seasonal habitats. Segment 1 is located south of the Sawyer migration route (Sawyer et al. 2009). The Sawyer migration route is one of the largest distinct mule deer migration patterns in the U.S. Mule deer and other big game, mostly pronghorn antelope, migrate in the fall from the upper Pinedale Anticline southward to winter at lower elevations. In the spring, the migration reverses northward to higher elevation habitats. While the migration route is not in Segment 1, big game will disperse into the Project area from the migration route during the winter. Segment 2 crosses the Red Desert to Hoback Migration Route, the longest mule deer seasonal migration route and one of the longest distinct ungulate migration movements in North America. Migration routes in Segment 3 are notable for having distinct and large numbers of pronghorn antelope that use the same migration routes annually. Pronghorn antelope and, less so, mule deer, use these routes to migrate between seasonal habitats. In the spring, these species migrate from lower elevation wintering habitat in the south to higher elevation summer foraging and parturition habitat (the latter is outside of Segment 3). The migration routes are typically located in geographic bottlenecks (i.e., valleys and gaps) located in topographically rugged terrain.

Table 3-176
Mule Deer, Antelope, Elk, and Moose Seasonal Ranges (miles crossed)

Alternative Route	Total Miles	Mule Deer					Antelope Crucial Winter Yearlong	Antelope Migration	Elk Crucial Winter Yearlong	Elk Migration	Elk Parturition	Moose Crucial Winter Yearlong
		Migration	Parturition	Crucial Winter	Crucial Winter Yearlong	Severe Winter						
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant												
1A: Proposed Action	30.4	0.6	0.0	22.9	0.0	0.0	12.7	2.1	3.5	0.0	0.0	7.3
1A Variation: Dry Basin Draw	30.7	1.2	0.0	23.2	0.0	0.0	12.8	2.2	3.5	0.0	0.0	7.3
1B: Dry Piney	34.5	1.7	0.0	27.0	0.0	0.0	6.4	2.2	3.5	0.0	0.0	7.3
1C: Figure Four	38.5	2.3	0.0	31.5	0.0	0.0	7.2	2.3	3.5	0.0	0.0	7.1

Table 3-176
Mule Deer, Antelope, Elk, and Moose Seasonal Ranges (miles crossed)

Alternative Route	Total Miles	Mule Deer					Antelope Crucial Winter Yearlong	Antelope Migration	Elk Crucial Winter Yearlong	Elk Migration	Elk Parturition	Moose Crucial Winter Yearlong
		Migration	Parturition	Crucial Winter	Crucial Winter Yearlong	Severe Winter						
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect												
2A: Proposed Action	129.1	0.0	1.0	5.7	0.0	5.5	31.6	5.7	12.4	2.0	1.0	0.0
2B: Southern Route	136.2	1.2	0.0	0.0	6.9	1.2	46.2	3.9	11.6	6.4	0.0	0.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect												
3A: Proposed Action	83.2	1.6	0.0	0.0	12.7	0.0	21.5	1.8	0.0	0.0	0.0	1.1
3B: Lost Creek to Lost Cabin	73.0	1.6	0.0	0.0	4.4	0.0	15.0	1.8	0.0	0.0	0.0	1.1
3C: Lost Creek to Highway 20/26	101.4	1.6	0.0	0.0	5.6	0.0	29.0	1.8	0.0	0.0	0.0	1.1

Chapter 4 – Environmental Consequences

Chapter 4 – Environmental Consequences

4.1 Introduction

This chapter describes the known and predicted effects on the existing environment that could result from the construction, operation, and maintenance of the Project and associated facilities, along the Proposed Action route and alternative pipeline routes, relevant to the issues and concerns identified during agency and public scoping. The analysis of potential environmental effects predicts how a resource would be affected and the degree of change (impact) that could result from implementation of an action. Potential environmental effects on each resource were determined through a systematic analysis that included assessing the impacts of each alternative route on the environment and how the impacts could be mitigated most effectively. An overview of the methodology for this analysis is presented in Section 4.2. Generally, each resource discussion is organized as follows:

- **Issues Identified for Analysis.** A description of the issues identified for each resource that was analyzed for the Project.
- **Types of Potential Effects.** A description of the general effects that may result from the Project.
- **Criteria for Assessing Impacts.** A description of the parameters used to evaluate impacts.
- **Mitigation Planning.** A description of the measures that would be applied to avoid, minimize, or otherwise mitigate impacts.
- **Results by Alternative Route.** A description of the high and moderate residual impacts after the application of agency-required mitigation measures.

A summary of baseline resource inventory and results of the effects analysis is presented in each resource section. Tables 2-21 to 2-23 present a comparison of the results of the effects analysis for the alternative routes. Table 2-24 presents a summary of the Project the extent to which the Project would parallel existing rights-of-way and jurisdiction by alternative route.

4.2 Approach to Analysis

The following text summarizes the methods used for studying and analyzing the Proposed Action and alternative routes developed in response to the need for the Project and the need for the affected federal agencies to respond to the Applicant's applications for rights-of-way on federal land. Consistent with Section 102(2)(A) of NEPA, the process described uses "a systematic interdisciplinary approach which would ensure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making, which may have an impact on man's environment" (as specified in 40 CFR 1507.2).

Law, policy, and the issues identified through the scoping process guide what studies of the natural, human, and cultural environments federal agencies must conduct and address in an interdisciplinary manner in the EIS. The studies for this Project were designed to develop an inventory of environmental data reflecting the existing condition of the environment in sufficient detail to:

- Predict potential or probable impacts on the environment that were brought about by the construction, operation, and maintenance of the proposed pipeline, transmission lines, access roads and ancillary facilities along each alternative pipeline route
- Prepare realistic recommendations to reduce or eliminate impacts identified during the analysis

- Compare the alternative routes based on interdisciplinary resource analysis and identify the alternative route exhibiting the least impact for each environmental resource category studied, as well as for the environment as a whole
- Meet the environmental reporting requirements of the BLM, in coordination with cooperating federal and state agencies and county and local governments

Data on the existing condition of each resource were gathered and compiled, between February and June 2015, from the most recent data available—primarily land-use plans and agency databases. Data gathered for visual resources were verified by field reconnaissance. The data were compiled in GIS at scales of 1:24,000 and 1:100,000.

For most of the resources, inventories were developed to describe the existing environment in the study corridors along the alternative routes in sufficient detail to assess potential direct and indirect impacts that could result from the Proposed Action and its alternative routes. The width of the study corridor was determined by the BLM interdisciplinary team and varies for each resource based on the area that potentially could be affected (Table 4-1). Analysis of air quality is based on regional data. Data used to assess potential impacts on social and economic conditions are countywide and are not extracted for study corridor-level analysis.

Table 4-1
Study Corridors by Resource

Resource	Study Corridor Width (miles)
Cultural resources	1
Fish and aquatics	2
Geology and topography resources	2
Lands and realty	2
Livestock grazing	2
National Trails System	6
Lands with wilderness characteristics	2
Paleontological resources	2
Recreation	2
Soils and reclamation	2
Special designations	2
Transportation and access	2
Vegetation	2
Visual resources	6
Water resources (including groundwater)	2
Wetlands and riparian areas	2
Wild horses and burros	2
Wildlife	2 to 8 (depending on species)

NOTE: Analysis of air quality is based on regional data. Data and information used to assess potential social and economic impacts are based on countywide data and are not extracted for corridor-level assessment.

The alternative routes (and study corridors) are centered on a line referred to as the reference centerline. The reference centerlines were mapped in detail sufficient for analysis for the EIS. Precise locations of the centerline would be refined through engineering surveys on the route selected for the pipeline prior to Project construction. Maps displaying resource inventory data are in the map volume.

4.2.1 Impact Assessment and Mitigation Planning

Impacts on the environment can result directly (caused by the action and occurs at the same time and place) or indirectly (caused by the action and is later in time or farther removed in distance, but still reasonably foreseeable) and can be temporary (short-term), long term, or permanent. The assumptions for each resource define temporal scope of analysis. In this analysis, temporary environmental effects predicted to occur during Project construction that would be anticipated to return to a preconstruction condition at or within 5 years of the end of construction were considered short-term impacts. Environmental effects that would be anticipated to remain for the life of the Project (approximately 30 years) were considered long-term impacts. Permanent impacts are those that would be anticipated to endure beyond the life of the Project, including irreversible and irretrievable commitment of resources. Impacts can be beneficial (positive) or adverse (negative) and can vary in significance from no change or only slightly discernible change to a full modification of the environment. Cumulative impacts result from the incremental effect of an action when added to other past, present, and reasonably foreseeable future actions (RFFA) and can result from individually minor but collectively significant actions taking place over a period of time. The approach used to address cumulative effects is described in Section 4.4.1.1.

Once the environmental inventory (baseline resource data) was compiled for each alternative route and the data were reviewed by the lead and cooperating agencies, potential effects of the Project were assessed and measures were recommended, where appropriate, to avoid, reduce, or eliminate the impacts (Table 4-2). The process of assessing impacts and applying measures to reduce impacts is a systematic interdisciplinary analysis that first identifies initial impacts based on a comparison of the Project (i.e., the predicted types and amounts of disturbance) and the existing condition of the environment (before the Project). Then, measures may be applied selectively on a case-by-case basis and often in localized areas to effectively reduce impacts further, thereby resulting in residual impacts or the impacts remaining after the application of the agency-required mitigation measures. In general, after the compiling the environmental inventory, the process for assessing impacts and applying measures to avoid or residual impacts included five main steps:

1. **Identify impact locations.** Determine where the Project would specifically affect the environment in the resource-specific study corridor.
2. **Identify impact types.** Identify the manner(s) in which the Proposed Action could affect the resource being analyzed.
3. **Assess the level of initial impacts.** Apply resource-specific criteria to determine the degree to which the environment would be affected.
4. **Identify whether mitigation planning is warranted.** Identify areas of moderate to high level initial impacts.
    a. **Develop mitigation recommendations.** Recommend agency-required mitigation measures that would avoid or reduce initial impacts and describe effectiveness.
    b. **Identify preliminary residual impacts.** Reassess impacts and determine impact level after recommended mitigation is applied.
    c. **Develop selective mitigation measures.** Review and finalize the locations and effectiveness of agency-required mitigation measures.
5. **Identify final residual impacts.** Document the levels of final residual impacts using the same resource-specific criteria; disclose residual impacts remaining after agency-required mitigation measures are applied.

Section 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.2.1.1 Initial Impacts

Based on resource inventory data reflecting the existing environment, each resource specialist determined the types and amounts of impacts that could occur on the resource (i.e., initial impacts). Computer-assisted models were developed to support this determination, which allowed the method used for each resource to be tailored to specific requirements, criteria, and assumptions for analysis of each resource. Qualitative and quantitative variables of resource sensitivity and resource quantity (and estimated ground disturbance where relevant to the resource) were considered in predicting the intensity of initial impacts. The intensity of the environmental effect also can vary. In this analysis, the intensity of impacts was described in the following levels: high impact, which could cause substantial change or stress to an environmental resource or use (severe adverse or exceptional beneficial effects); moderate impact, which potentially could cause some change or stress to an environmental resource or use (readily apparent effects); low impact, which could be detectable but slight; and no identifiable impact. What constitutes a low, moderate, or high impact on a resource varies by resource and is described for each resource in this chapter.

Due to the nature of available data, potential effects on cultural resources were evaluated using a modified approach (refer to Section 0). In short, criteria developed to assess potential effects on cultural resources were based on the presence/absence of significant cultural resources (e.g., historic properties and properties of traditional or spiritual importance to tribes or other cultural communities or ethnic groups) that could be encountered along each alternative pipeline route; the nature of potential effects on sites of cultural importance; and the overall density of sites for each of the alternative routes as identified from the literature search.

4.2.1.2 Mitigation Planning and Effectiveness

After initial impacts were identified for each resource, agency-required mitigation measures to mitigate impacts for environmental protection (Table 4-2) were applied to avoid, reduce, or minimize moderate or high impacts. Agency-Required mitigation measures include measures or techniques recommended or required (depending on land ownership) by the BLM after initial impacts were identified and assessed. As such, agency-required mitigation measures provide a planning tool for minimizing potential adverse impacts.

For some resources (e.g., biological, cultural, and paleontological resources), pedestrian surveys conducted using agency-approved protocols would be required on the selected route prior to construction (and based on the final design of the Project). The survey results would be used by the agencies to refine the mitigation requirements and further inform the POD. Additionally, mitigation to offset or compensate for impacts on some resources may require mitigation measures and conservation actions to achieve land-use plan goals and objectives and provide for sustained yield of natural resources on public lands, while continuing to honor the agency's multiple-use missions. The sequence of mitigation action would comply with the mitigation identified by the CEQ (40 CFR 1508.20)—Mitigation and could include measures for the BLM to consider for compensating for an impact by replacing or providing substitute resources or environments. Examples include creation or restoration of wetlands, off-site vegetation treatments to improve sage-grouse or migratory bird habitat, purchase of property or conservation easements to provide long-term protection for sage-grouse or migratory bird habitats, or appropriate mitigation for impacts on designated National Scenic and/or Historic Trails. If applicable, additional mitigation requirements would be approved by the agencies and incorporated into the POD prior to Project construction.

Table 4-2
Agency-Required Mitigation Measures

Agency-Required Mitigation Measure		Application Phase[1]			Effectiveness
		Design and Engineering	Construction	Operation and Maintenance	
1.	**Sensitive Resource Avoidance** Avoidance can be achieved by: ▪ reduction of the width of the right-of-way to avoid a sensitive resource or site; ▪ micro-siting (i.e., adjusting the alignment of the pipeline route placement of surface facilities or construction access routes); or ▪ alternative construction techniques, including horizontal drilling (e.g., HDD under streams, riparian areas, sage grouse leks).	✓	✓		Flexibility in the placement of facilities allows sensitive features to be avoided. Realigning the pipeline and/or associated transmission lines along an alternative route or realigning the alternative route (micro-siting), to the extent practicable, can result in avoiding or minimizing direct and indirect impacts on resources (e.g., cultural, biological, water, noise, and visual), as well as land uses (e.g., agriculture, parks, hazardous substance remediation, and recreation areas). Additionally, the pipeline or associated facilities could be realigned, to the extent practicable, in areas with high concern viewsheds to locate structures to result in reduced visual contrast and visibility.
2.	**Minimize Construction on Greater Slopes** ▪ Roads will be prohibited in slopes greater than 25 percent. ▪ In areas where slopes are greater than 20 percent, development will be limited. Development will be avoided where grades are between 15 and 24 percent. ▪ Rights-of-way authorized will require a construction and mitigation plan to prevent soil loss that will include measures to be taken depending on degree or range of slope (i.e., 0 to 15 percent slope; 10 to 15 percent slope; greater than 15 percent slope, etc.).	✓			Minimizing construction on steep slopes decreases the potential for erosion and water runoff, thus minimizing potential damage from rutting, which, in turn, protects adjacent vegetation.

Table 4-2
Agency-Required Mitigation Measures

Agency-Required Mitigation Measure	Application Phase[1]			Effectiveness
	Design and Engineering	Construction	Operation and Maintenance	
3. <u>Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation</u> In areas where soils and vegetation are particularly sensitive to disturbance, existing roads/two-tracks to be used for construction and maintenance would not be widened or otherwise upgraded to the extent practicable. To allow construction equipment access to work areas where the equipment would extend beyond the width of the existing roads, the construction equipment would straddle the road traveling on the road's shoulder only where terrain and soil conditions would allow for safe operation /transport of the equipment (cranes, etc.). The BLM would work with the Applicant to determine the extent these existing roads could be modified versus fully upgraded to ensure the roads/two-tracks are passable and safe for the equipment and construction and maintenance personnel. This agency-required mitigation measure would be applied on the following areas: ▪ soils that are highly susceptible to accelerated wind or water erosion and are on Prime Farmlands (refer to Chapter 3, Section 3.2.15.7 Erosion Potential); ▪ within 500 feet (153 meters) of streams, wetlands, water, and riparian vegetation communities; ▪ occupied habitat for federally listed threatened, endangered, proposed threatened or petitioned plant species; and ▪ other locations, where required to comply with law, regulation, or BLM or other agency policy based on the results of preconstruction biological resource surveys of the route selected for construction.	✓	✓	✓	Limiting ground disturbance would minimize exposure of soils highly or moderately susceptible to wind or water erosion. The potential for increased erosion and sedimentation as a result of soil compaction and/or decompaction would be reduced as well as the loss of soil-stabilizing vegetation. Limiting ground disturbance would also limit the potential for fugitive dust from exposed soils.

Table 4-2
Agency-Required Mitigation Measures

Agency-Required Mitigation Measure		Application Phase[1]			Effectiveness
		Design and Engineering	Construction	Operation and Maintenance	
4.	**Blend Road Cuts and Grading** Soil amendments, mineral emulsions, or asphalt emulsions (i.e., Permeon™ or approved equal) will be applied, or grading techniques, such as slope rounding and slope scarification, will be used to blend road and structure work area cuts into the landscape in areas of steep terrain where grading is necessary, in rocky areas, or where solid color would create strong landscape contrasts.	✓	✓	✓	The intent of this measure is to reduce visual contrast between the exposed ground of the road or structure work areas and the surrounding environment. Additionally, the application of soil amendments, mineral emulsions, or asphalt emulsions would further reduce the visual contrast between exposed ground and the surrounding environment.
5.	**Overland Access** ▪ Construction access is limited to overland drive-and-crush (i.e., vegetation is crushed, but not cropped. Soil is compacted, but no surface soil is removed). Examples may include access to work areas, spur roads, and wetland areas requiring crane mats for access. Even though vegetation may be damaged and even destroyed, the surface soil and seed bank remain in place. Some crushed vegetation will likely resprout after disturbance ceases. These activities will result in minimal to moderate disturbance that does not significantly modify the landscape; or ▪ Construction access may also be limited to overland clear-and-cut (i.e., vegetation is brushed off to improve or provide suitable access for equipment and vehicles. Most woody shrub vegetation is removed and soils are compacted, but no surface soil is removed. Examples include temporary access roads where overland access may be used in the construction of facilities or in some areas where roads may be improved for access (selective tree and brush clearing). In general, clear-and-cut activities will result in moderate amounts of disturbance but no blading occurs.		✓		Overland access would avoid or minimize the removal of surface soil and vegetation where soils are susceptible to wind and water erosion, reducing the potential for erosion and loss of habitat. Limiting vegetation and soil removal would minimize potential for fugitive dust from exposed soils. Avoiding constructing a new road would reduce the potential for increased traffic and the associated indirect effects, including the introduction of invasive weeds and special status wildlife habitat fragmentation.

Table 4-2
Agency-Required Mitigation Measures

Agency-Required Mitigation Measure		Application Phase[1]			Effectiveness
		Design and Engineering	Construction	Operation and Maintenance	
6.	**<u>Minimizing Tree Clearing</u>** Removal of trees in the right-of-way will be minimized to limit disturbance to reduce visual contrast and protect sensitive habitat to the extent practicable. Trees and other vegetation will be removed selectively (e.g., edge feathering) to blend the edge of the right-of-way into adjacent vegetation patterns, as practicable and appropriate. This agency-required mitigation measure would be applied on the following areas: ▪ trees that contain active raptor nests and winter roosts; ▪ riparian vegetation communities; ▪ in other locations, where required to comply with law, regulation, or BLM or other agency policy based on the results of preconstruction biological resource surveys of the route selected for construction; and ▪ where crossing recreation sites and non-motorized trails to reduce impacts on recreation experience.		✓	✓	Minimizing tree removal in and along the edges of the right-of-way, or limiting the width of the area cleared in the right-of-way, reduces disruption of habitat, minimizes removal of timber resources, allows compatible land uses to continue, and reduces the visual contrast between the right-of-way and the surrounding environment. By minimizing the number of trees cleared in sensitive habitats, the extent of wildlife habitat fragmentation would be reduced and opportunities created to protect raptor nesting habitats. Furthermore, feathering the edges of the right-of-way instead of cutting trees and vegetation in a straight line results in a more gradual modification to the environment and the hard visual line created by the cleared right-of-way/forest interface.
7.	**<u>Seasonal Restrictions</u>** Avoiding surface-disturbing or disruption activities associated with construction, operation, and maintenance of the Project during sensitive periods for wildlife and plants, including: ▪ special status species; ▪ big game fawning areas; ▪ crucial habitats; ▪ raptor nests and winter roosts; and ▪ sage-grouse leks and core/priority habitats.		✓	✓	Restricting construction activities or maintenance during identified sensitive periods would avoid potential disturbance of plants or wildlife during critical periods of their life cycles.

Table 4-2
Agency-Required Mitigation Measures

Agency-Required Mitigation Measure		Application Phase[1]			Effectiveness
		Design and Engineering	Construction	Operation and Maintenance	
8.	**<u>Interim and Intense Reclamation</u>** ▪ Interim reclamation may include stabilization and/or irrigation of specific areas where establishment of seedlings has been shown or is expected to be difficult (e.g., soil types prone to wind erosion; vegetation communities prone to noxious weeds or disturbance); may include irrigation. ▪ Intense reclamation (beyond reseeding) may be required (typically) for locations where higher impacts on biological, cultural-visual, soil, and/or visual resources have been identified and greater consideration for concentrated, or species explicit, reclamation treatments may be warranted to achieve management objectives or prescriptions for a resource (e.g., VRM Class II areas; riparian areas or wetlands; sage-grouse focal areas). However, equally important as the identified resource impact is consideration of the vegetation community's potential to naturally rehabilitate itself in and adjacent to the Project right-of-way without reclamation treatments being applied; may include a variety of techniques (e.g., including changing seed mixes, planting shrub/perennial, color treatments of exposed soil/rock).		✓	✓	Reclaiming disturbed areas following construction by rectifying the effects of construction by repairing, rehabilitating, or restoring the affected environment would reduce and eliminate the effects over time.

Table 4-2
Agency-Required Mitigation Measures

Agency-Required Mitigation Measure		Application Phase[1]			Effectiveness
		Design and Engineering	Construction	Operation and Maintenance	
9.	**<u>Minimize New or Improved Accessibility</u>** Closing and rehabilitating construction access roads. To limit new or improved access into the Project area, all new or improved access (e.g., blading widening existing access) and work areas not required for maintenance would be closed or rehabilitated using the most effective and least environmentally damaging methods appropriate to the area and developed through consultation with the land owner or BLM. Methods for road closure or management include installing and locking gates, obstructing the path (e.g., earthen berms, boulders, redistribution of woody debris), revegetating and mulching the surface of the road bed to make it less apparent, restoring the road to its natural contour and vegetation, or constructing waterbars to ensure proper drainage. This measure would be applied to: ▪ greater sage-grouse core areas and habitat within 4 miles of leks inside and outside of core areas;		✓	✓	Closing access roads where they are not needed after construction protects the area resources from further disturbance, such as damage or loss of vegetation, spread of noxious weeds, noise, harassment of wildlife, vandalism of cultural resources, and disturbance to sensitive land uses (e.g., parks, preservation, and recreation areas). Closing access roads would (1) restore existing natural features; (2) limit public access to wildlife populations; (3) reduce stress, noise, and disturbance to wildlife, special status wildlife and habitats during critical life-cycle periods; (4) reduce anthropogenic disturbance, and traffic; all of which would consequently reducing erosive attributes (e.g., soil compaction, decompaction, rutting). Additionally, visual contrast would be reduced through restoring existing features in naturally intact and highly visible areas.

Table 4-2
Agency-Required Mitigation Measures

	Agency-Required Mitigation Measure	Application Phase[1]			Effectiveness
		Design and Engineering	Construction	Operation and Maintenance	
10.	**<u>Limit Accessibility in Sensitive Habitats</u>** Where feasible, construction access roads and permanent access roads that are not closed and rehabilitated that cross sensitive habitat would be gated or otherwise blocked in cooperation with the appropriate land-management agencies to limit public access. This agency-required mitigation measure would be applied on the following areas: ▪ Elk crucial seasonal habitats, migration routes, and calving grounds; ▪ Moose crucial seasonal habitats and calving grounds; ▪ Mule deer crucial seasonal habitats, migration routes, and fawning areas; ▪ Pronghorn crucial season habitats, migration routes, and fawning areas; ▪ Areas in proximity to active raptor nests and winter roosts ▪ Occupied habitat for federally listed threatened, endangered, proposed threatened, or petitioned plan species; and ▪ In other locations, where required to comply with law, regulation, or BLM or other agency policy based on the results of preconstruction biological resource surveys of the route selected for construction.		✓	✓	Limiting access to access roads would restore existing natural features as well as limit public access to wildlife populations, reduce stress, noise and disturbance to wildlife, special status wildlife and habitats during critical life-cycle periods, anthropogenic disturbance, and traffic; consequently, reducing erosive attributes (e.g., soil compaction, decompaction, rutting).

Once an alternative route is selected, the Applicant would coordinate with the BLM and other land-management agencies or landowners, as appropriate, to refine the implementation of mitigation at specific locations or areas based on final Project design. For example, if a road closure was recommended, the Applicant would work with the applicable land-management agency or landowner to determine the specific method of road closure most appropriate for the site or area. This detailed mitigation would be incorporated into the POD prior to Project construction.

4.2.1.3 Residual Impacts

Residual impacts are the environmental effects that remain after agency-required mitigation measures are applied. After the locations of potential residual impacts were identified, the intensities of such potential residual impacts anticipated to occur from implementation of an alternative along the reference centerline were assessed and mapped (Volume II). They are discussed in the environmental effects sections for each resource in this chapter. The description of residual effects anticipated for each alternative should be reviewed in conjunction with the resource inventory maps provided in the map volume.

Reasonably foreseeable residual effects on resources that are expected to remain after the application of mitigation measures that would inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies may warrant additional appropriate mitigation. Refer to Section 4.5.

4.3 Results of Direct and Indirect Impact Analysis

4.3.1 Air Quality (Including Greenhouse Gas Emissions and Climate Change)

4.3.1.1 Issues Identified for Analysis

The following issues were identified for analysis during the scoping process for this study.

- Potential for additional air quality in the UGRB marginal ozone nonattainment area
- Ensuring conformance with Wyoming General Conformity Requirements in the UGRB marginal ozone nonattainment area
- Potential impacts due to emissions of criteria pollutants and HAPs
- Potential emissions of H_2S
- Potential impacts on AQRVs in Class I and sensitive Class II areas
- Mitigation of any anticipated impacts on air quality or AQRVs
- Fugitive dust during construction activities
- GHG emissions
- Contribution to ongoing and projected regional climate change in the Project area
- Emissions from the Normally Pressured Lance Project, the La Barge Platform Project, and potentially the Bird Canyon Project (considered in the cumulative impact analysis)

4.3.1.2 Types of Potential Effects

This section describes the potential impacts or effects on regional air quality and climate change that may result from the Project. NEPA regulations recognize three classes of effects or impacts: direct, indirect, and cumulative. Section 4.2.1.1, 4.2.1.2, and 4.2.1.3 offer further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

An example of a direct impact on air quality would be increased ambient air particulate concentration due to dust emissions from construction activities. An indirect impact on air quality would be additional air emissions from increased local traffic that result from population growth generated by the Project. Air

pollutant emissions from these example scenarios could combine with emissions from other unrelated activities in the area to produce cumulative impacts.

The intensity of an impact depends on the magnitude or extent of an effect and on a resource's overall vulnerability. Thus, the assessment of the intensity of potential effects considers the following conditions:

- Would the quantity and nature of criteria air pollutants from estimated Project emissions be expected to potentially cause or contribute to an exceedance of a national or state air quality standard for any criteria pollutant?
- Would the quantity and nature of estimated Project air pollutant emissions be expected to contribute substantially to the degradation of an important AQRV at a surrounding CAA Class I or Sensitive Class II area? AQRVs are identified by responsible federal land managers and can include such attributes as visibility, acidification of surface waters due to acid deposition, sediment erosion, increases in salinity, and harm to vegetation due to deposition of toxic metals.
- Would the estimated Project emissions of HAPs be reasonably expected to increase chronic carcinogenic risk above a generally acceptable level?
- Would the Proposed Action conflict with BLM RMP standards for air quality?

Climate impacts are global in nature and result from complex interactions between multiple physical factors and large-scale geologic and atmospheric systems. Although it is not possible to quantify the effects on local, regional, or global climates due to GHG emissions from a specific project or even a region, there is broad scientific consensus that globally cumulative GHG emissions are contributing to changes in regional climates. The assessment of potential climate effects from the Project considers:

- GHG emissions from Project-related activities compared to State, National and Global GHG emissions, and
- Potential intensification of environmental effects related to the Project due to anticipated GHG emissions

4.3.1.3 Criteria for Assessing Impacts

The proposed Riley Ridge Sweetening Plant would emit air pollutants and would be subject to federal and state air quality regulations that are driven by the federal CAA of 1970 and its amendments. All permitted sources in Wyoming are required to employ Best Available Control Technology.

4.3.1.4 Mitigation Planning

Initial impacts are those effects resulting from the implementation of the Project, including implementation of design features of the Proposed Action for environmental protection (Table 2-18). The specific design features of the Proposed Action for environmental protection relevant to air resources include:

- **Design Feature 9 (roads reclamation).** Applied to roads that are no longer needed. Unneeded roads would be recontoured and revegetated.
- **Design Feature 19 (air quality – dust control).** Applied to access roads or sections of the right-of-way as needed. Mandatory speed limits (e.g., 35 mph) would be implemented on vehicles using access roads or traveling the right-of-way.
- **Design Feature 20 (air and vehicle emissions).** Applied to ensure that construction equipment is maintained in good working condition and contains appropriate pollution control devices to minimize gaseous emissions.

Residual impacts represent anticipated effects to air resources following implementation of agency-required mitigation measures (refer to Table 4-2). The agency-required mitigation measures applied to avoid, reduce, or minimize impacts on air quality include:

- **Agency-Required Mitigation Measure 3 (minimize or avoid disturbance to sensitive soils and vegetation).** Applied to minimize ground disturbance and the potential for fugitive dust emissions.

The Proposed Action would be subject to federal and state air quality regulations that are driven by the federal CAA of 1970 and its amendments. Additional agency-required mitigation measures may be applied in accordance with applicable permits or dust control plans approved by the WDEQ.

4.3.1.5 Analysis Approach

Direct effects were analyzed by first identifying equipment and activities in the POD that would emit pollutants into the atmosphere. These can be grouped into construction activities and activities related to operation. Both types of activities apply to the Riley Ridge Sweetening Plant and to the pipeline. Next, estimates were made of the quantities, locations, and periods of those emissions using provided design information, including design features. Descriptions of emissions estimation methods are presented below. Finally, potential impacts on air quality and climate were evaluated based on the estimated quantities and temporal and special distribution of air pollutant emissions.

Indirect effects were analyzed by identifying and characterizing air-pollutant-emitting activities that could reasonably be foreseen to result from the Project but that would occur at some time or distance removed from the Project.

4.3.1.5.1 Estimating Construction Activity Emissions

Construction activities have the potential to cause short-term adverse impacts on air quality in the Project area. Air pollutant emissions from construction activities would include particulate and gaseous emissions.

Potential sources of particulate (PM_{10} and $PM_{2.5}$) emissions during the Riley Ridge Sweetening Plant and pipeline construction include fugitive dust from vehicles and equipment traveling on access roads and engine exhaust from construction equipment. The potential for fugitive dust emissions will generally be greater for alternative routes with greater areas of disturbance necessary to construct the pipeline, set up staging areas, and develop access roads. Table 4-3 summarizes the estimated land disturbance for each alternative.

Table 4-3
Total Disturbed Area for Alternative Routes

Alternative Route	Total Miles	Temporary Disturbance[1,4,5] (acres)	Permanent Disturbance[2,4,5] (acres)	Permanent Right-of-Way Reclaimed[3,4,5] (acres)
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant				
1A: Proposed Action	30.4	371	21	192
1A Variation: Dry Basin Draw	30.7	374	21	194
1B: Dry Piney	34.5	415	23	218
1C: Figure Four	38.5	459	24	243
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect				
2A: Proposed Action	129.1	1,868	123	819
2B: Southern Route	136.2	1,967	127	864

Table 4-3
Total Disturbed Area for Alternative Routes

Alternative Route	Total Miles	Temporary Disturbance[1,4,5] (acres)	Permanent Disturbance[2,4,5] (acres)	Permanent Right-of-Way Reclaimed[3,4,5] (acres)
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect				
3A: Proposed Action	83.2	1,276	54	527
3B: Lost Creek to Lost Cabin	73.0	1,124	48	462
3C: Lost Creek to Highway 20/26	101.4	1,547	64	642

SOURCE: Calculations in this table are derived from information provided in the Applicant's Project description
NOTES:
[1]Temporary disturbance includes estimated area of disturbance associated with the temporary right-of-way, ATWS, staging areas, temporary disturbance at the Riley Ridge Sweetening Plant, temporary disturbance associated with the H_2S acid gas injection wells and flowlines, and temporary disturbance associated with the 69kV transmission line.
[2]Permanent disturbance includes estimated area of disturbance associated with pipe yards, access roads outside of the permanent right-of-way, MLVs, pig L/R sites, the Riley Ridge Sweetening Plant, the H_2S acid gas injection wells and flowlines, the substation, and the Bairoil Valve Site Interconnect.
[3]Permanent right-of-way reclaimed includes the portion of the permanent right-of-way that will be reclaimed after construction. The disturbance in the permanent right-of-way associated with the pig L/R sites, the Riley Ridge Sweetening Plant, MLVs, and the Bairoil valve site are not included.
[4]Disturbance has not been associated with the distribution lines. Additional information has been requested from the Applicant.
[5]Calculations include an additional 5 percent contingency.

The exhaust emissions for construction were estimated by multiplying the construction equipment emission factors by the construction schedule (e.g., 1 mile of pipeline construction/day and 12-hour work days). Criteria pollutant and HAP equipment-specific emission factors from the EPA's NONROAD 2008a model were used to estimate the tailpipe emissions.

The Project construction operations would generate fugitive dust emissions from earth-moving activities and wind erosion of disturbed acreage. Particulate emissions from earth-moving were estimated using an emission factor of 1.2 tons of particulate matter/acre/month of activity found in U.S. EPA AP-42 Chapter 13.2.3, Heavy Construction Operations. Wind erosion from disturbed areas was estimated using the 0.38 tons of particulate matter/acre/year found in EPA AP-42 Chapter 11.9, Western Surface Coal Mining. Both factors are for total suspended particulate (TSP), so were reduced by 50% to estimate PM_{10}.

Emissions from construction sources, such as traffic, construction equipment, fugitive dust from earth-moving, etc., are generally not subject to federal or state limitations but in some cases, do require mitigation (such as watering of disturbed areas) or are indirectly regulated through limitations imposed on the subject equipment itself (e.g., motor vehicle tailpipe standards or diesel engine performance standards). The total criteria pollutant and HAPs emission estimates are shown in Section 4.3.1.6 for the No Action Alternative and the individual alternative routes.

4.3.1.5.2 Estimating Operating Activity Emissions

The Riley Ridge Sweetening Plant would generate emissions during its operation. Sources of emissions include the flare, fired disposal vaporizer, backup generator, and fugitive emissions. Emission estimates were developed by the Riley Ridge Sweetening Plant construction contractor on behalf of the Applicant. Annual emissions values were estimated based on 8,760 hours of operation. EPA AP 42 Emission Factors were used for emission estimates when vendor data was not available. Emission estimates from Riley Ridge Sweetening Plant operation are presented in Section 4.3.1.6.

Air pollutant emissions from operating the pipeline would be minimal. Minor transient emissions would occur from maintenance activities along the Project right-of-way. Emissions would include exhaust from maintenance vehicles and equipment, as well as fugitive dust from maintenance activities, wind erosion, or vehicular traffic. The IPCC describes CO_2 emissions from pipelines as follows: "…virtually all of the fugitive emissions from a Center for Climate Strategies (CCS) system will be associated with the initial CO_2 capture and compression facilities at the start of the pipeline and the injection facilities at the end of the pipeline with essentially no emissions from the pipeline itself." (IPCC 2006, page 5.10) Denbury (2018) reports that approximately 0.5 percent of CO_2 injected for EOR is emitted to the atmosphere during injection, recovery, and recycling operations. Fugitive losses associated with CO_2 supply acquisition, transfer, and compression are expected to be of a similar magnitude.

4.3.1.5.3 Estimating Emissions for General Conformity

In 1993 the EPA promulgated a rule, codified at 40 CFR 93, requiring federal actions to conform to State Implementation Plans. This federal rule is implemented for non-transportation projects in Wyoming by WAQSR Chapter 8, Section 3. Conformity means that a federal action will not interfere with strategies to attain or maintain compliance with an ambient air quality standard in an area that is or formerly had been determined to be in nonattainment with the standard. A determination of conformity for a proposal affecting a marginal ozone nonattainment area is required if appropriate potential annual emissions of either of the precursor pollutants NO_x or VOCs would exceed a *de minimis* threshold of 100 tons (refer to WAQSR Chapter 8, Section 3(c) (ii)).

The UGRB marginal ozone nonattainment area would be affected by all Segment 1 activities and a portion of Segment 2 activities. This study evaluates applicability to the Project of conformity requirements by quantifying maximum annual NO_x and VOC emissions that would occur within the UGRB marginal ozone nonattainment area and comparing them against the 100-ton thresholds. Note that a general conformity analysis is not required for permitted activities, such as operation of the proposed Riley Ridge Sweetening Plant (40 CFR 93.153(d)(1)). Section 4.3.1.8.2 details the methods used to estimate relevant emission rates and the results obtained.

4.3.1.6 Criteria and Hazardous Air Pollutant Results

4.3.1.6.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved, the Project would not be developed, and air quality would remain as it presently exists.

4.3.1.6.2 Effects Common to All Alternative Routes

Because essentially pure CO_2 will be transported, pipeline emissions of criteria and HAPs will be negligible. Additionally, the pipeline's physical and operational design would ensure negligible fugitive emissions. An existing SCADA control center located at company headquarters in Plano, Texas, would be utilized to monitor and control the Project's operations. This control center would include a leak monitoring system. For these reasons, the pipeline would produce minor fugitive emissions during its operation and any leaks would be detected by the SCADA center.

Federal, state, and local air quality regulatory programs provide a useful baseline for determining the significance of impacts on air quality from a proposed project. Generally, these programs regulate emissions from mobile and stationary sources to an extent that has been determined adequate to promote a healthful environment. With that framework in mind, a project that complies with the full set of applicable air quality regulations is considered to emit air pollutants at an acceptable level resulting in impacts that are, by extension, not considered substantial. Many of the activities associated with the

Project are not regulated because they have not been identified as potentially significant contributors to air quality degradation. These activities include various construction activities and traveling on paved and unpaved roads. Finally, some emissions activities, such as operating fuel burning equipment and vehicles, are regulated at the manufacturer level by placing requirements on the products.

Air pollutant emission rates resulting from operating the Riley Ridge Sweetening Plant and the pipeline would be small relative to typical emission rates from stationary industrial sources. Riley Ridge Sweetening Plant operations would be restricted by applicable air quality regulations and permit conditions designed to ensure that impacts on public health are within the bounds of acceptability as implied or defined within state and federal rules and statutes. Construction activities would not be subject to stationary source regulations, including permitting requirements, though mobile source construction equipment would likely be subject to mobile source regulations that generally apply to the equipment manufacturers and not, substantively, to owner/operators.

Most of the Proposed Action would be constructed in rural areas with little or no potential to affect local human populations. Pipeline construction activity would be dispersed over a 2- to 3-year period and over a geographical expanse covering hundreds of miles. Instantaneous localized pollutant concentrations could be relatively high under some meteorological conditions but would not persist except during protracted temperature inversions that are not favored by the Project area topography.

The closest any of the proposed alternative pipeline routes would come to a Class I airshed is 22 miles; (the Bridger Wilderness, which is upwind of the Project). Most distances between the alternative routes and surrounding Class I areas are much larger. Although quantitative air quality effects were not modeled for this Project, modeling analyses of similar sources have shown that pollutant concentrations typically decrease rapidly with distance. Based on this experience, the Project's impacts on Class I area airsheds would likely be small.

Indirect impacts from the Project would derive from additional traffic related to increased employment in the area. Once operational, minimal maintenance on the pipeline would be expected; therefore, traffic-related impacts would be minimal. Consequently, additional traffic related to economic growth would be minimal and amount to only a small fraction of existing traffic levels in the Project area.

Finally, implementation of the proposed emissions-mitigating design features for all construction and operation activities would further reduce impacts on air quality.

Overall, the differences in potential impacts on air quality from construction of any of the alternative routes are negligible, and no alternative is expected to cause substantially adverse air quality effects. Emissions from pipeline operation would be infrequent and short-term and would result in no significant impact on air quality.

4.3.1.6.3 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Construction of the proposed Riley Ridge Sweetening Plant is projected to take 2 years. Construction of Segment 1 is expected to take less than 1 year. All Segment 1 alternative routes and the proposed Riley Ridge Sweetening Plant would be located entirely within the UGRB marginal ozone nonattainment area. Potential impacts on the UGRB marginal ozone nonattainment area will be addressed in the subsequent sections.

4.3.1.6.3.1 Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction

The Riley Ridge Sweetening Plant would emit air pollutants and would be subject to federal and state air quality regulations that are driven by the federal CAA of 1970 and its amendments. All permitted sources in Wyoming are required to employ Best Available Control Technology. Notifications, recordkeeping, reports, and performance tests may be required. Strict adherence to applicable regulations would minimize the potential air quality impacts from the operation of the Riley Ridge Sweetening Plant.

Riley Ridge Sweetening Plant construction equipment emissions, including those for two H_2S disposal wells, were estimated based on the number and types of equipment that would be used and on the construction schedule. Table 4-4 summarizes the estimated tailpipe emissions from Riley Ridge Sweetening Plant construction.

Table 4-4
Criteria and Hazardous Air Pollutant Emissions from Riley Ridge Sweetening Plant Construction – Tailpipe Emissions

Source	Expected Construction Duration (days)	CO (tons)	NO_x (tons)	SO_2 (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	VOC (tons)	HAPs (tons)
Riley Ridge Sweetening Plant Construction Equipment[1]	730	19.2	48.1	2.3	5.0	3.0	4.4	0.5
H_2S Well Pad Construction Equipment	30	0.8	2.0	0.1	0.2	0.1	0.2	0.0
Riley Ridge Sweetening Plant H_2S Disposal Well Flowline Construction Equipment	90	1.1	0.9	0.0	0.2	0.2	0.2	0.0
H_2S Disposal Well Drilling[2]	300	2.9	6.6	0.0	0.2	0.7	0.1	0.0
Drilling Traffic – During Drilling of the H_2S Disposal Wells	300	11.4	30.3	1.8	3.5	1.8	3.1	0.4
Drill Rig – Move Traffic to Next Well Location	4	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Total:		**35.5**	**88.0**	**4.2**	**9.1**	**5.8**	**8.0**	**0.9**

NOTES:
[1]Sweetening Plant construction is expected to occur over 2 years. The Sweetening Plant construction equipment estimates presented are for two years of construction, combined.
[2]H_2S disposal well construction duration is expected to be 150 days per well, 300 days total.

All construction equipment would be maintained in good working condition and would contain appropriate pollution control devices to minimize gaseous emissions.

Riley Ridge Sweetening Plant Operation

Emission estimates for the operation of the Riley Ridge Sweetening Plant were developed by the construction contractor on behalf of the Applicant. Annual emissions values were estimated based on 8,760 hours of operation. EPA AP-42 Emission Factors were used for emission estimates when vendor data were not available.

Potential sources for emissions from the Riley Ridge Sweetening Plant are as follows:

- Flare
- Fired disposal vaporizer
- Backup generator
- Fugitive emissions

Criteria and HAP emissions from the Riley Ridge Sweetening Plant during normal operation are summarized in Table 4-5.

Table 4-5
Criteria and Hazardous Air Pollutant Emissions (tons per year)
from the Riley Ridge Sweetening Plant Operation

Source	CO	NO_x[2]	SO_2	PM_{10}	$PM_{2.5}$	VOC[2]	H_2S
Flare	0.2	0.1	–	–	–	0.2	0.2
Fired Disposal Vaporizer	29.8	16.3	–	–	–	2.4	–
Backup Generator[1]	0.6	5.3	0.0	0.0	0.0	0.1	–
Fugitive Emissions	–	–	–	–	–	Negligible	Negligible
Total	**30.5**	**21.7**	**0.0**	**0.0**	**0.0**	**2.6**	**0.2**

SOURCE: Confidential emissions summary from 2013
NOTES:
[1]Backup generator emissions are based on a full load of 1,848 break horsepower and 500 hours/year operation.
[2]Net facility-wide NO_x and VOC emissions would be zero or negative because Denbury would be required to offset emissions with reductions elsewhere per WDEQ rules and policy.

The facility would comply with applicable standards for VOC emissions sources, including the use of a smokeless flare and automatic igniter or continuous pilot as required by WAQSR Chapter 3 Section 6(b). Because the facility would be inside the UGRB marginal ozone nonattainment area, Denbury would be required to offset potential facility-wide NO_x and VOC emissions with an equal or greater amount of approved reductions elsewhere in the Project area.

All potential emission points of H_2S would be routed to the flare. All connections in the plant would be welded to minimize the potential for emissions of H_2S into the atmosphere.

In addition, the Riley Ridge Sweetening Plant would require fewer than 20 employees; therefore, traffic-related impacts would be minimal.

Injection Wells

Construction and operation of the proposed injection wells would comply with applicable standards for VOC emissions sources. All potential emission points of H_2S would be routed to the flare.

Segment 1 Alternative Routes

The Segment 1 Route segments vary between 30.4 miles to 38.0 miles in length. All Segment 1 alternative routes are located entirely within the UGRB Ozone Nonattainment Area. Segment 1 construction equipment emissions were estimated based on the number and types of equipment and construction alternative routes.

Table 4-6
Criteria and Hazardous Air Pollutant Emissions from Pipeline Construction – Tailpipe Emissions for Segment 1

Alternative Route	Total Miles	NO_x (tons)	SO_2 (tons)	CO (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	VOC (tons)	HAPs (tons)
1A: Proposed Action	30.4	18	1	6	2	1	2	0.20
1A Variation: Dry Basin Draw	30.7	18	1	6	2	1	2	0.20
1B: Dry Piney	34.5	20	1	7	2	1	2	0.22
1C: Figure Four	38.5	22	1	8	2	1	2	0.25

Segment 1 construction would also generate fugitive dust emissions from earth-moving activities and wind erosion of disturbed areas. Fugitive dust emission estimates are shown in Table 4-7.

Table 4-7
PM_{10} and $PM_{2.5}$ Emissions – Construction and Wind Erosion for Segment 1

Alternative Route	Total Acres Disturbed	Construction (tons)		Wind Erosion (tons)[4]		Total (tons)	
		PM_{10}[1,3]	$PM_{2.5}$[2,3]	PM_{10}[1,3]	$PM_{2.5}$[2,3]	PM_{10}[1,3]	$PM_{2.5}$[2,3]
Sweetening Plant	39	663	99	20	3	683	102
1A: Proposed Action	371	111	17	50	7	161	24
1A Variation: Dry Basin Draw	374	112	17	50	8	163	24
1B: Dry Piney	415	125	19	56	8	180	27
1C: Figure Four	459	138	21	62	9	199	30

NOTES:
[1]A total suspended particulate to PM_{10} ratio of 0.5 was applied to the 1.2 tons of particulate matter/acre/month of activity based on guidance in AP-42 Table 11.9-1.
[2]A $PM_{10}/PM_{2.5}$ ratio of 0.1 was applied based on EPA guidance (EPA 2014).
[3]A control efficiency of 50 was applied to emission estimates based on the Applicant's emissions-mitigating design features of wet dust suppression and vehicle speed restrictions. Per guidance in AP-42 Chapter 13.2.2, 75 percent control is a conservatively low control estimate for the proposed activities.
[4]Wind erosion emissions per year were calculated as follows: the start of construction was used to calculate how many days were left in the year (e.g., 153 days in 2018 based on construction start date of August 1, 2018). The proportion of this year experiencing wind erosion is 42 percent (153 wind erosion days/366 days in 2018). Wind erosion for one full year occurring in 2019 after route construction was completed was then added. This results in a conservative estimate of greater than 518 days of wind erosion for each alternative.

The emissions estimates are proportionate to the alternative route length and construction schedule. Due to the variations in length and corresponding construction schedule, air pollutant emissions would be lowest from Alternative 1A: Proposed Action construction and highest from Alternative 1C: Figure Four construction.

4.3.1.6.4 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Segment 2 consists of two alternative routes. Within the UGRB marginal ozone nonattainment area are 44.6 miles of Alternative 2A: Proposed Action and 32.5 miles of Alternative 2B: Southern Route. Segment 2 construction equipment emissions were estimated based on the number and types of equipment and construction schedule. Table 4-8 summarizes the estimated exhaust emissions from each of the Segment 2 alternative routes.

Table 4-8
Criteria and Hazardous Air Pollutant Emissions
from Pipeline Construction – Exhaust Emissions for Segment 2 Alternative Routes

Alternative Route	Total Miles	NO_x (tons)	SO_2 (tons)	CO (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	VOC (tons)	HAPs (tons)
2A: Proposed Action	129.1	74.8	4.1	27.3	8.2	4.2	7.6	0.8
2B: Southern Route	136.2	78.9	4.3	28.8	8.6	4.5	8.1	0.9

Segment 2 construction would also generate fugitive dust emissions from earth-moving activities and wind erosion of disturbed areas. Fugitive dust emission estimates are shown in Table 4-9.

Table 4-9
PM_{10} and $PM_{2.5}$ Emissions – Construction and Wind Erosion for Segment 2

Alternative Route	Total Acres Disturbed	Construction (tons)		Wind Erosion (tons)[4]		Total (tons)	
		PM_{10}[1,3]	$PM_{2.5}$[2,3]	PM_{10}[1,3]	$PM_{2.5}$[2,3]	PM_{10}[1,3]	$PM_{2.5}$[2,3]
2A: Proposed Action	1,868	560	84	251	38	812	122
2B: Southern Route	1,967	590	89	265	40	855	128

NOTES:
[1]A total suspended particulate to PM_{10} ratio of 0.5 was applied to the 1.2 tons of particulate matter/acre/month of activity based on guidance in AP-42 Table 11.9-1.
[2]A $PM_{10}/PM_{2.5}$ ratio of 0.1 was applied based on EPA guidance (EPA 2014).
[3]A control efficiency of 50 percent was applied to emissions estimates based on the Applicant's emissions-mitigating design features of wet dust suppression and vehicle speed restrictions. Per guidance in AP-42 Chapter 13.2.2, 75 percent control is a conservatively low control estimate for the proposed activities.
[4]Wind erosion emissions per year were calculated as follows: the start of construction was used to calculate how many days were left in the year (e.g., 153 days in 2018 based on construction start date of August 1, 2018). The proportion of this year experiencing wind erosion is 42 percent (153 wind erosion days/366 days in 2018). Wind erosion for one full year occurring in 2019 after route construction was completed was then added. This results in a conservative estimate of greater than 518 days of wind erosion for each alternative.

The emissions estimates are proportionate to the alternative route length and construction schedule. Due to the variations in length and corresponding construction schedule, Alternative 2A: Proposed Action has the lower construction equipment emissions estimates, while Alternative 2B: Southern Route has the higher.

4.3.1.6.5 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Segment 3 consists of three alternative routes. None of the alternative routes cross the UGRB marginal ozone nonattainment area. Segment 3 construction equipment emissions were estimated based on the number and types of equipment and construction schedule. Table 4-10 summarizes the estimated exhaust emissions from each of the Segment 3 alternative routes.

Table 4-10
Criteria and Hazardous Air Pollutant Emissions for Pipeline Construction – Tailpipe Emissions for Segment 3

Alternative Route	Total Miles	NO_x (tons)	SO_2 (tons)	CO (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	VOC (tons)	HAPs (tons)
3A: Proposed Action	83.2	48.2	2.6	17.6	5.3	2.7	4.9	0.5
3B: Lost Creek to Lost Cabin	73.0	42.3	2.3	15.4	4.6	2.4	4.3	0.5
3C: Lost Creek to Highway 20/26	101.4	58.7	3.2	21.4	6.4	3.3	6.0	0.7

Segment 3 construction would also generate fugitive dust emissions from earth-moving activities and wind erosion of disturbed areas. Fugitive dust emission estimates are shown in Table 4-11.

Table 4-11
PM_{10} and $PM_{2.5}$ Emissions – Construction and Wind Erosion for Segment 3

Alternative Route	Total Acres Disturbed	Construction (tons)		Wind Erosion (tons) [4]		Total (tons)	
		PM_{10} [1,3]	$PM_{2.5}$ [2,3]	PM_{10} [1,3]	$PM_{2.5}$ [2,3]	PM_{10} [1,3]	$PM_{2.5}$ [2,3]
3A: Proposed Action	1,276	383	57	172	26	555	83
3B: Lost Creek to Lost Cabin	1,124	337	51	151	23	488	73
3C: Lost Creek to Highway 20/26	1,547	464	70	208	31	672	101

NOTES:
[1]A total suspended particulate to PM_{10} ratio of 0.5 was applied to the 1.2 tons of particulate matter/acre/month of activity based on guidance in AP-42 Table 11.9-1.
[2]A $PM_{10}/PM_{2.5}$ ratio of 0.1 was applied based on EPA guidance (EPA 2014).
[3]A control efficiency of 50 percent was applied to emissions estimates based on the Applicant's emissions-mitigating design features of wet dust suppression and vehicle speed restrictions. Per guidance in AP-42 Chapter 13.2.2, 75 percent control is a conservatively low control estimate for the proposed activities.
[4]Wind erosion emissions per year were calculated as follows: the start of construction was used to calculate how many days were left in the year (e.g., 153 days in 2018 based on construction start date of August 1, 2018). The proportion of this year experiencing wind erosion is 42 percent (153 wind erosion days/366 days in 2018). Wind erosion for one full year occurring in 2019 after route construction was completed was then added. This results in a conservative estimate of greater than 518 days of wind erosion for each alternative.

The emissions estimates are proportionate to the alternative route length and construction schedule. Due to the variations in length and corresponding construction schedule, Alternative 3B: Lost Creek to Lost Cabin has the lowest construction equipment emissions estimates, while Alternative 3C: Lost Creek to Highway 20/26 has the highest.

4.3.1.6.6 230-Kilovolt Transmission Line

Denbury would coordinate with PacifiCorp for the utility to construct an approximately 1-mile-long 230kV transmission line that would bring power from an existing PacifiCorp 230kV transmission line. The 230kV connecting line would result in approximately 10 acres of temporary disturbance and represents approximately 2 to 2.5 percent of the total disturbed area and estimated emissions associated with the Segment 1 alternative routes. This disturbance area estimate associated with the 230kV line is included in the estimated Project surface disturbance values identified in Table 2-7 and is accounted for in the Segment 1 emissions estimates shown in Table 4-6 and Table 4-7.

4.3.1.6.7 Mainline Valve Distribution Lines

A total of 28 MLVs would be installed at regular intervals along the pipeline and would be electric or solar powered. The total disturbed area from construction of the 28 MLVs is estimated to be less than 5 acres. This represents less than 3 percent of the total permanently disturbed area from construction of the entire pipeline (refer to Table 2-7).

The proposed underground pipeline's physical and operational design would ensure that its only air pollutant emissions would consist of minor amounts of CO_2 escaping through valves and connections that cannot be welded. An existing SCADA control center located at company headquarters in Plano, Texas, would be utilized to monitor and control the Project's operations. This control center would include a leak monitoring system. For these reasons, the pipeline would produce minor fugitive emissions during its operation, and any leaks would be detected by the SCADA center.

4.3.1.7 Emissions Summaries by Year

Annual air pollutant emissions throughout Project construction were estimated based on the construction schedule in Table 2-17. The proposed construction time frame of Segment 1 would be August 1, 2018, through November 30, 2020, and would include the Riley Ridge Sweetening Plant, H_2S disposal wells, transmission lines, and CO_2 pipeline construction. Pipeline construction within Segment 2 would occur between August 1, 2019, and November 30, 2019. Pipeline construction within Segment 3 would occur between August 1, 2018, and November 30, 2018, and would coincide with a portion of Segment 1 construction activities. To estimate annual emission rates during the construction phase of the Project, the Riley Ridge Sweetening Plant was assumed to be fully operating by the year 2020 after the 2-year construction period was complete.

Activity	2018		2019				2020				2021			
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Segment 1														
Sweetening Plant Area Construction Activities		21%	50%				29%							
Sweetening Plant Operation											100%			
Segment 1 CO2 Pipeline		100%												
Wind Erosion Following Pipeline Construction			100%											
Segment 2														
Segment 2 CO2 Pipeline					100%									
Wind Erosion Following Pipeline Construction							100%							
Segment 3														
Segment 3 CO2 Pipeline		100%												
Wind Erosion Following Pipeline Construction			100%											

Figure 4-1 Construction Time Line

Maximum combined annual emissions estimates for the Project were calculated by multiplying maximum total emission rates for each segment and activity by the proportion of a given year that the activity would occur. Breakdowns and totals are presented for each criteria pollutant and for total HAP emissions in Table 4-12 through Table 4-18.

Table 4-12
Nitrogen Oxides Emissions by Activity and Year

Activity	Subtotal	2018	2019	2020	2021
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
Riley Ridge Sweetening Plant Area Construction Activities	88.0	15.8	37.7	34.5	0.0
Riley Ridge Sweetening Plant Operation	21.7	0	0	0	21.7
CO_2 Pipeline Construction (Alternative 1C: Figure Four)	22.3	22.3	0.0	0.0	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
CO_2 Pipeline Construction (Alternative 2B: Southern Route)	78.9	0.0	78.9	0.0	0.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
CO_2 Pipeline Construction (Alternative 3C: Lost Creek to Highway 20/26)	58.7	58.7	0.0	0.0	0.0
Total	**269.6**	**96.8**	**116.6**	**34.5**	**21.7**

NOTE: [1]Effective net facility-wide NO_x emissions from Riley Ridge Sweetening Plant operations would be zero or negative because Denbury would be required to offset emissions with reductions elsewhere, per WDEQ rules and policy.

Table 4-13
Sulphur Dioxide Emissions by Activity and Year

Activity	Subtotal	2018	2019	2020	2021
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
Riley Ridge Sweetening Plant Area Construction Activities	4.2	0.8	1.8	1.7	0.0
Riley Ridge Sweetening Plant Operation	0.0	0	0	0	0
CO_2 Pipeline Construction (Alternative 1C: Figure Four)	1.2	1.2	0.0	0.0	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
CO_2 Pipeline Construction (Alternative 2B: Southern Route)	4.3	0.0	4.3	0.0	0.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
CO_2 Pipeline Construction (Alternative 3C: Lost Creek to Highway 20/26)	3.2	3.2	0.0	0.0	0.0
Total	**13.0**	**5.2**	**6.1**	**1.7**	**0.0**

Table 4-14
Carbon Monoxide Emissions by Activity and Year

Activity	Subtotal	2018	2019	2020	2021
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
Riley Ridge Sweetening Plant Area Construction Activities	35.5	6.4	15.2	13.9	0.0
Riley Ridge Sweetening Plant Operation	30.5	0	0	0	30.5
CO_2 Pipeline Construction (Alternative 1C: Figure Four)	8.1	8.1	0.0	0.0	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
CO_2 Pipeline Construction (Alternative 2B: Southern Route)	28.8	0.0	28.8	0.0	0.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
CO_2 Pipeline Construction (Alternative 3C: Lost Creek to Highway 20/26)	21.4	21.4	0.0	0.0	0.0
Total	**124.3**	**35.9**	**44.0**	**13.9**	**30.5**

Table 4-15
PM_{10} Emissions by Activity and Year

Activity	Subtotal	2018	2019	2020	2021
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
Riley Ridge Sweetening Plant Area Construction Activities	9.1	1.6	3.9	3.6	0.0
Riley Ridge Sweetening Plant Operation	0.0	0	0	0	0
CO_2 Pipeline Construction (Alternative 1C: Figure Four)	2.4	2.4	0.0	0.0	0.0
Pipeline Wind Erosion following Construction	882.2	126	378	378	0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
CO_2 Pipeline Construction (Alternative 2B: Southern Route)	8.6	0.0	8.6	0.0	0.0
Pipeline Wind Erosion following Construction	854.8	0.0	213.7	641.1	0.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
CO_2 Pipeline Construction (Alternative 3C: Lost Creek to Highway 20/26)	6.4	6.4	0.0	0.0	0.0
Pipeline Wind Erosion following Construction	672.3	168.1	504.2	0.0	0.0
Total	**2,435.97**	**304.61**	**1,108.57**	**1,022.80**	**0.00**

Table 4-16
$PM_{2.5}$ Emissions by Activity and Year

Activity	Subtotal	2018	2019	2020	2021
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
Riley Ridge Sweetening Plant Area Construction Activities	5.8	1.0	2.5	2.3	0.0
Riley Ridge Sweetening Plant Operation	0.0	0	0	0	0
CO_2 Pipeline Construction (Alternative 1C: Figure Four)	1.3	1.3	0.0	0.0	0.0
Pipeline Wind Erosion following Construction	132.3	19	57	57	0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
CO_2 Pipeline Construction (Alternative 2B: Southern Route)	4.5	0.0	4.5	0.0	0.0
Pipeline Wind Erosion following Construction	128.2	0.0	32.1	96.2	0.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
CO_2 Pipeline Construction (Alternative 3C: Lost Creek to Highway 20/26)	3.3	3.3	0.0	0.0	0.0
Pipeline Wind Erosion following Construction	100.8	25.2	75.6	0.0	0.0
Total	**376.25**	**49.75**	**171.35**	**155.15**	**0.00**

Table 4-17
Volatile Organic Compound Emissions by Activity and Year

Activity	Subtotal	2018	2019	2020	2021
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
Riley Ridge Sweetening Plant Area Construction Activities	8.0	1.4	3.4	3.1	0.0
Riley Ridge Sweetening Plant Operation	2.6	0	0	0	2.6
CO_2 Pipeline Construction (Alternative 1C: Figure Four)	2.3	2.3	0.0	0.0	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
CO_2 Pipeline Construction (Alternative 2B: Southern Route)	8.1	0.0	8.1	0.0	0.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
CO_2 Pipeline Construction (Alternative 3C: Lost Creek to Highway 20/26)	6.0	6.0	0.0	0.0	0.0
Total	**26.9**	**9.7**	**11.5**	**3.1**	**2.6**

Table 4-18
Hazardous Air Pollutants Emissions by Activity and Year

Activity	Subtotal	2018	2019	2020	2021
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
Riley Ridge Sweetening Plant Area Construction Activities	0.9	0.2	0.4	0.4	0.0
Riley Ridge Sweetening Plant Operation	0.2	0	0	0	0.2
CO_2 Pipeline Construction (Alternative 1C: Figure Four)	0.2	0.2	0.0	0.0	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
CO_2 Pipeline Construction (Alternative 2B: Southern Route)	0.9	0.0	0.9	0.0	0.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
CO_2 Pipeline Construction (Alternative 3C: Lost Creek to Highway 20/26)	0.7	0.7	0.0	0.0	0.0
Total	**2.9**	**1.1**	**1.3**	**0.4**	**0.2**

4.3.1.8 UGRB Marginal Ozone Nonattainment Area

4.3.1.8.1 Proposed Riley Ridge Sweetening Plant Operation

The WDEQ developed an Interim Policy on Demonstration of Compliance with WAQSR Chapter 6 for Sources in Sublette County (WDEQ 2008). For projects that will construct or modify a NO_x or VOC emitting source in Sublette County, the policy document provides for three options for demonstrating that the project will not prevent the attainment or maintenance of any ambient air quality standard (e.g., ozone):

1. Model ambient ozone impacts
2. Secure emissions reductions for VOC and/or NO_x
3. Propose an alternative demonstration method and get it approved

The policy defines acceptable emissions offsets, including:

- 1.5:1 for VOC
- 1.1:1 for NO_x

The Applicant has reported that it has obtained the NO_x and VOC emissions offsets from WDEQ for the proposed Riley Ridge Sweetening Plant and will meet the requirements of the ozone nonattainment area. The Riley Ridge Sweetening Plant would be subject to federal and state air quality regulations that are driven by the federal CAA of 1970 and its amendments. Strict adherence to applicable regulations would minimize the potential air quality impacts from the Riley Ridge Sweetening Plant.

4.3.1.8.2 General Conformity

As discussed above, all of Segment 1 and a portion of Segment 2 are within the UGRB marginal ozone nonattainment area, and the BLM must, therefore, consider whether the Project would conform to state and federal air quality regulations designed to attain and maintain compliance with the ozone NAAQS (refer to WAQSR Chapter 8, Section 3). The requirement to conduct a "conformity analysis" may not apply if the Project's potential annual NO_x and VOC emissions within the nonattainment area would each be less than 100 tons per year *de minimis* threshold. The following paragraphs describe the methods used to estimate relevant emission rates and the results obtained.

Total pollutant emissions for each segment and alternative route are reported in a previous section. Comparing estimated emission rates with the conformity analysis *de minimis* threshold requires a two-step process. First, segregate potential NO_x and VOC emissions associated with activities within the UGRB nonattainment area from the alternative route totals. Second, annualize the segregated nonattainment area emissions. All the emissions from Segment 1 activities (excluding Riley Ridge Sweetening Plant operation) contribute to the analysis and, therefore, require no segregation. To isolate applicable UGRB emissions within each alternative route from Segment 2, each alternative's total NO_x and VOC emissions were multiplied by the right-of-way length within the nonattainment area and then divided by the total right-of-way length for that alternative.

This analysis indicates that maximum NO_x and VOC emissions in the Segment 2 portion of the UGRB marginal ozone nonattainment area would result from construction activities in Alternative 2A: Proposed Action.

Next, all appropriate emissions are summed for each year of the Project construction period, including Sweetening Plant and disposal wells construction. Because all of Segment 2 construction activities would occur during 2018, the maximum NO_x and VOC emissions shown in Table 4-19 (for Alternative 2A: Proposed Action) are added to the corresponding maximum Segment 1 emissions for 2018 shown in Table 4-12 and Table 4-17. For the remaining years, the appropriate maximum annual emissions from Segment 1 construction activities, as shown in Table 4-12 and Table 4-17, are added together. Results are presented in Table 4-20 and Table 4-21.

Table 4-19
Conformity Analysis for Segment 2 Alternative Routes

Alternative Route	Total Miles	Nonattainment Area Miles	Ratio of Total within Nonattainment Area	NO_x Emissions (tons per year)		VOC Emissions (tons per year)	
				Total	Nonattainment Area	Total	Nonattainment Area
2A: Proposed Action	129.10	44.6	0.35	74.8	25.8	7.6	2.6
2B: Southern Route	136.20	32.5	0.24	78.9	18.8	8.1	1.9

Table 4-20
Nitrogen Oxides Emissions in the Upper Green River Basin Nonattainment Area by Year

Activity	2018	2019	2020	2021
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant				
Sweetening Plant Area Construction Activities	15.8	37.7	34.5	0.0
CO_2 Pipeline Construction (Alternative 1C: Figure Four)	22.3	0.0	0.0	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect				
CO_2 Pipeline Construction (Alternative 2B: Southern Route)	0.0	25.8	0.0	0.0
Total	**38.1**	**63.5**	**34.5**	**0.0**

NOTE: Emissions from Riley Ridge Sweetening Plant operations are not evaluated for conformity because they would be subject to limits and conditions imposed by a stationary source air quality permit issued by WDEQ.

Table 4-21
Volatile Organic Compound Emissions in the Upper Green River Basin Nonattainment Area by Year

Activity	2018	2019	2020	2021
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant				
Riley Ridge Sweetening Plant Area Construction Activities	1.4	3.4	3.1	0.0
CO_2 Pipeline Construction (Alternative 1C: Figure Four)	2.3	0.0	0.0	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect				
CO_2 Pipeline Construction (Alternative 2B: Southern Portion)	0.0	2.6	0.0	0.0
Total	**3.7**	**6.1**	**3.1**	**0.0**

NOTE: Emissions from Riley Ridge Sweetening Plant operations are not evaluated for conformity because they would be subject to limits and conditions imposed by a stationary source air quality permit issued by WDEQ.

The preceding analysis indicates that estimated annual NO_x and VOC emissions from the proposed Project within the UGRB ozone nonattainment area would not exceed 100 tons per year for either pollutant.

4.3.1.9 Climate Change

The analysis of climate change includes two components: first, consideration of the reasonably foreseeable GHG emissions resulting from the proposed action and alternatives; and second, evaluation of how climate change impacts the affected environment, including the full range of resources analyzed in this document. The later analyses are incorporated, as appropriate, within the other chapters in this study. The remainder of this subsection addresses potential GHG emissions associated with Project activities. Three GHGs are relevant with respect to this study: CO_2, CH_4, and N_2O. GHG emission rates are typically quantified in terms of CO_2e. The CO_2e is a virtual pollutant that combines the quantities and proportional climate-change effectiveness—known as GWP—of each of the relevant GHGs. The GWP for CO_2 is arbitrarily set at 1, and the other pollutants are assigned values relative to CO_2's effectiveness. For example, the EPA uses a GWP for CH_4 of 25; therefore, 1 ton of CH_4 emissions equals 25 tons of CO_2e, whereas 1 ton of CO_2 emissions equals 1 ton of CO_2e.

4.3.1.9.1 Greenhouse Gas Emissions

GHG emissions associated with the Proposed Action would result from constructignng and operating the proposed Riley Ridge Sweetening Plant; from transferring CO_2 from supply sources to the pipeline; and from injecting, separating, and re-injecting CO_2 at oil wells. Pipeline construction would result in tailpipe GHG emissions from construction equipment. Fugitive GHG emissions from the pipeline would be negligible (see Section 4.3.1.5.2).

Pipeline construction activities associated with the Proposed Action would generate GHG emissions along the Project right-of-way and on roadways resulting from construction-related traffic. These emissions are quantified in Sections 4.3.1.9.1.3 through 4.3.1.9.1.5.

Construction-related emissions have been estimated using emission factors included in EPA's NONROAD 2008a model and EPA's Mandatory Greenhouse Gas Reporting Rule[1]. Emission estimates for Riley Ridge Sweetening Plant operation are presented in Section 4.3.1.9.1.2. Potential fugitive emissions associated with migration of injected CO_2 to the surface are also discussed in Section 4.3.1.9.1.2. CO_2 transported via the proposed pipeline would be used at the Bell Creek Field and other oilfields in southeastern Montana for EOR. Carbon dioxide would be injected into subsurface oil-bearing formations to enhance oil production from existing and depleted oil wells. Oil recovered as a result of the Proposed Action would be transported, refined, and combusted. Life cycle GHG emissions from these activities are characterized in Section 4.3.1.9.1.2.

4.3.1.9.1.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved, the Project would not be developed, and GHG emissions would be unchanged.

4.3.1.9.1.2 Effects Common to All Alternative Routes

GHG emissions would potentially result from the following activities related to the Proposed Action:

- Pipeline construction
- Riley Ridge Sweetening Plant construction
- Riley Ridge Sweetening Plant operation
- CO_2 supply and injection
- Recovered oil transport, processing, and combustion (life cycle emissions)

Potential emissions due to pipeline equipment and fitting leaks and to subsurface CO_2 migration are assumed to be negligible (see discussion below).

Proposed Action alternatives only would produce variable emissions related to pipeline construction due to varying construction activity intensities for varying segment lengths. Emissions from other listed activities would be constant for all alternatives. GHG emissions related to constructing each alternative route are described in the next sections. Emissions related to Riley Ridge Sweetening Plant construction are included in the discussion of Segment 1 construction emissions.

The construction contractor for the Riley Ridge Sweetening Plant estimated CO_2e annual emissions associated with plant operations to be approximately 44,600 metric tons.[2] Plant emissions sources are an emergency flare, a fired disposal vaporizer, a backup generator, and equipment leaks.

Fugitive CO_2 emissions from leaking components in the pipeline would be negligible (see Section 4.3.1.5.2). Small quantities of CO_2 would leak from equipment used to transfer CO_2 from its sources to the pipeline and from the pipeline to oil wells, as well as from equipment used to separate dissolved CO_2 from recovered oil and to reinject it. During Bell Creek EOR operations in 2013, 0.5 percent of injected CO_2 leaked to the atmosphere (Denbury 2018). Front-end fugitive losses associated with CO_2 supply acquisition, transfer, and compression are expected to be of a similar magnitude, resulting in an approximately 1 percent combined equipment leak rate from operations at both ends of the pipeline. The

[1]40 CFR Part 98
[2]Source: Confidential 2013 emissions summary produced by Air Products on behalf of Denbuy Resources, Inc.

Proposed Action maximum injection rate of previously stored CO_2 is approximately 32,300 metric tons per day. This would result in annual CO_2e emissions of approximately 2.8 million metric tons.

Fresh CO_2 would be injected into the closed-loop injection-recycle system make-up for the small amount vented or leaked from surface equipment and for CO_2 that remains underground. Denbury (SWCA 2014b, page 1-1) claims that, "Once injected, the CO_2 remains sequestered underground unless it is produced with recovered oil."

Multiple studies have modeled crude oil life cycle GHG emissions with various specific objectives. The models are complex with multiple inputs requiring varying ranges of estimations and assumptions. Life cycle GHG emissions for the Proposed Action were estimated using information from a study conducted to derive 2014 baseline life cycle GHG emission factors for the United States in 2014 and to project those factors through 2040 (Cooney, et. al 2016). The study derives CO_2e emission factors based on energy contained in gasoline, diesel, and jet fuel (Cooney, et. Al 2016 [Table 1, page 983]). These factors and energy density values for the three fuels (Neutrium 2014) were used to calculate CO_2e emissions per gallon of each fuel. A combined weighted average emission factor was calculated based on 2016 average United States refinery yields of gasoline, diesel, and jet fuel, which comprised over 90 percent of combustible refinery products (U.S. Energy Information Administration 2017). This composite factor was then applied to the high range estimate of tertiary reserves in the Bell Creek Field of 50 million barrels (Denbury 2018) to estimate 22.5 million metric tons of total life cycle CO_2e emissions potentially resulting from the Proposed Action.

4.3.1.9.1.3 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction

Riley Ridge Sweetening Plant construction is expected to take 2 years, resulting in approximately 24,000 metric tons of CO_2e emissions. The annual GHG emissions from the operation of the Riley Ridge Sweetening Plant (49,000 metric tons) would be 0.07 percent of Wyoming's 2013 GHG emissions. Table 4-22 summarizes the GHG emission during the construction phase of the Riley Ridge Sweetening Plant.

Table 4-22
Greenhouse Gas Emissions for Riley Ridge Sweetening Plant Construction – Tailpipe Emissions

Source	Construction Duration (days)[1]	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	Total CO_2e (metric tons)[2]
Riley Ridge Sweetening Plant Construction Equipment	730	12,111	0.5	0.1	12,153
H_2S Well Pad Construction Equipment	30	498	0.0	0.0	499
Riley Ridge Sweetening Plant H_2S Disposal Well Flowline Construction Equipment	90	620	0.0	0.0	622
H_2S Disposal Well Drilling[3]	300	1,627	0.1	0.0	1,632
Drilling Traffic – During Drilling of the H_2S Disposal Wells	300	9,505	0.4	0.1	9,538

Table 4-22 **Greenhouse Gas Emissions for Riley Ridge Sweetening Plant Construction – Tailpipe Emissions**					
Source	**Construction Duration (days)[1]**	**CO_2 (metric tons)**	**CH_4 (metric tons)**	**N_2O (metric tons)**	**Total CO_2e (metric tons)[2]**
Drill Rig – Move Traffic to Next Well Location	4	20	0.0	0.0	20
Total:		**24,381**	**1**	**0**	**24,465**
NOTES: [1]GHG estimates based on an equipment operating schedule of 12 hours/day. [2]GWPs of 1 for CO_2, 25 for CH_4, and 298 for N_2O used to determine CO_2e as per 40 CFR Part 98 Subpart A. [3]H_2S Disposal Well construction duration is expected to be 150 days per well, 300 days total.					

Potential sources for GHG emissions from the operation of the Riley Ridge Sweetening Plant are as follows:

- Flare
- Fired disposal vaporizer
- Backup generator
- Fugitive emissions

GHG emissions estimates were developed by the Riley Ridge Sweetening Plant construction contractor on behalf of the Applicant and are summarized in Table 4-23.

Table 4-23 **Greenhouse Gas Emissions for Riley Ridge Sweetening Plant Operation**					
Equipment	**Operation Schedule (hours/year)**	**CO_2 (tons)**	**CH_4 (tons)**	**N_2O (tons)**	**Total CO_2e (metric tons)[1]**
Flare	8,760	7,615	0.0	0.0	7,615
Fired Disposal Vaporizer Design	8,760	36,461	0.0	0.0	36,461
Backup Generator	500	478	0.0	0.0	480
Fugitive Emissions	8,760	0	0.0	0.0	0
Total:		**44,554**	**0.0**	**0.0**	**44,556**
NOTE: [1]GWPs of 1 for CO_2, 25 for CH_4, and 298 for N_2O used to determine CO_2e as per 40 CFR Part 98 Subpart A.					

GHG emissions during the construction phase of each alternative route were estimated in the same manner. Table 4-24 summarizes the estimated GHG emissions during the construction phase of each Segment 1 alternative route.

Injection Wells

GHG for the injection wells is included in the above analysis of the Riley Ridge Sweetening Plant.

Segment 1 Pipeline Alternative Routes

Segment 1 consists of the proposed Riley Ridge Riley Ridge Sweetening Plant and four alternative routes:

- 1A: Proposed Action
- 1A Variation: Dry Basin Draw
- 1B: Dry Piney
- 1C: Figure Four

Table 4-24 Greenhouse Gas Emissions – Tailpipe Emissions for Segment 1					
Alternative Route	**Total Miles**	**CO_2 (metric tons)**	**CH_4 (metric tons)**	**N_2O (metric tons)**	**Total CO_2e (metric tons)[1]**
1A: Proposed Action	30.4	5,270	0.21	0.00	5,275
1A Variation: Dry Basin Draw	30.7	5,322	0.22	0.04	5,340
1B: Dry Piney	34.5	5,980	0.24	0.05	6,001
1C: Figure Four	38.5	6,674	0.27	0.05	6,697
NOTE: [1]GWPs of 1 for CO_2, 25 for CH_4, and 298 for N_2O used to determine CO_2e as per 40 CFR Part 98 Subpart A.					

The GHG emissions estimates are proportionate to the alternative route length and construction schedule. Due to the variations in length and corresponding construction schedule, GHG emissions would be lowest from Alternative 1A: Proposed Action construction and highest from Alternative 1C: Figure Four construction.

4.3.1.9.1.4 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Segment 2 contains two alternative routes. GHG emissions were estimated in the same manner as in Segment 1, using the EPA's NONROAD emission factors, the number and type of construction equipment, and the construction schedule. Table 4-25 summarizes the estimated Segment 2 GHG emissions for each alternative route.

Table 4-25 Greenhouse Gas Emissions – Tailpipe Emissions for Segment 2					
Alternative Route	**Total Miles**	**CO_2 (metric tons)**	**CH_4 (metric tons)**	**N_2O (metric tons)**	**Total CO_2e (metric tons)[1]**
2A: Proposed Action	129.1	22,379	0.91	0.18	22,455
2B: Southern Route	136.2	23,609	0.96	0.19	23,690
NOTE: [1]GWPs of 1 for CO_2, 25 for CH_4, and 298 for N_2O used to determine CO_2e as per 40 CFR Part 98 Subpart A.					

The GHG emissions estimates are proportionate to the alternative route length and construction schedule. Due to the variations in length and corresponding construction schedule, GHG emissions would be lower from Alternative 2A: Proposed Action construction and higher from Alternative 2A: Southern Route construction.

4.3.1.9.1.5 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Segment 3 contains three alternative routes. GHG emissions were estimated in the same manner as in Segments 1 and 2, using the EPA's NONROAD emission factors, the number and type of construction equipment, and the construction schedule. Table 4-26 summarizes the estimated Segment 3 GHG emissions for each alternative route.

Table 4-26 Greenhouse Gas Emissions – Tailpipe Emissions for Segment 3					
Alternative Route	**Total Miles**	**CO_2 (metric tons)**	**CH_4 (metric tons)**	**N_2O (metric tons)**	**Total CO_2e (metric tons)[1]**
3A: Proposed Action	83.2	14,422	0.59	0.12	14,472
3B: Lost Creek to Lost Cabin	73.0	12,654	0.51	0.10	12,698
3C: Lost Creek to Highway 20/26	101.4	17,577	0.71	0.14	17,637
NOTE: [1]GWPs of 1 for CO_2, 25 for CH_4, and 298 N_2O used to determine CO_2e as per 40 CFR Part 98 Subpart A.					

The GHG emissions estimates are proportionate to the alternative route length and construction schedule. Due to the variations in length and corresponding construction schedule, GHG emissions would be lowest from Alternative 3B: Lost Creek to Lost Cabin construction and highest from Alternative 3C: Lost Creek to Highway 20/26 construction.

4.3.1.10 Climate Change Effects Summary

The nature of the impacts would be the same among all alternative routes. The intensity of pipeline construction-related impacts from the Proposed Action alternatives are proportionate to the alternative route length and construction schedule. For this reason, impacts are anticipated to be least for the combination of shortest alternative routes (1A: Proposed Action; 2A: Proposed Action; and 3A: Proposed Action). Impact intensity is anticipated to be the greatest for the combination of the longest alternative routes (Alternatives 1C: Figure Four; 2B: Southern Route; and 3C: Lost Creek to Highway 20/26).

Total maximum emissions from pipeline and sweetening plant construction would be approximately 72,500 metric tons of CO_2e emissions over the course of approximately 2 to 3 years. Maximum annual CO_2e construction emissions would be approximately 24,200 to 36,300 metric tons depending on construction period duration. Potential emissions related to other Proposed Action activities are reported in Section 4.1.1.9.1.2.

For context, total energy-related GHG emissions in 2015 were 65 and 5,249 million metric tons in Wyoming and in the United States, respectively (U.S. Energy Information Administration 2018). Table 4-27 summarizes project-related GHG emissions (as CO_2e) and compares them to relevant state- and nation-wide emissions.

Table 4-27
Summary of Proposed Action-Related GHG Emissions

Activity	CO_{2e} Emissions (million metric tons/yr)	Fraction of Wyoming Annual CO_{2e} Emissions[1]	Fraction of U.S. Annual CO_{2e} Emissions[1]
Pipeline Construction[2, 3]	0.024	0.037%	0.000%
Sweetening Plant Construction[3]	0.012	0.019%	0.000%
Total Construction[3]	0.036	0.056%	0.001%
Front and Back-end Surface Equipment Leaks	2.83	4.37%	0.054%
Sweetening Plant Operation	0.045	0.069%	0.001%
Total Operations	2.87	4.44%	0.055%
Total Project	2.91	4.49%	0.055%
Wyoming[1]	65	–	–
United States[1]	5,249	–	–

NOTES:
[1]Wyoming and United States GHG emissions result from energy-related sources in 2015 as reported by the U.S. Energy Information Administration (2018).
[2]Represents worst-case combination of longest route alternatives.
[3]Represents worst-case annual emissions from a two-year construction period.

Fugitive emissions from pipeline equipment and fittings and from subsurface CO_2 migration are assumed to be negligible as discussed above. However, although monitoring of surface releases from injected CO_2 has been conducted for many years and is ongoing, no results have been made publicly available. Without site-specific or site-related scientific analysis or empirical data, it is not possible to independently confirm this assumption.

Estimated life cycle GHG emissions resulting from oil that would be produced as a result of the Proposed Action are reported in Section 4.1.1.9.1.2 (22.5 million metric tons). They are not included in the above table because they cannot be translated into an annual rate without speculating on the length of time the recovered oil would be produced and used. It is certain, however, that annual emissions would be much smaller than total emissions.

There is broad consensus that global climates have been changing, and will continue to change into the future, with a primary result being generally increasing temperatures. This anticipated trend of climate change is not expected to exacerbate the adverse air quality impacts discussed herein to the point that they become significant.

Estimates of Project-related GHG emission quantities help characterize potential intensity of climate effects, and comparisons with state- and nation-wide GHG emissions provides context. However, at this time there is no known Project-level significance threshold of GHG emissions for climate change, nor is it possible to attribute discrete environmental effects to GHG emissions (FERC 2018, page 6).

4.3.2 Cultural Resources

This section presents the analysis of potential impact on cultural resources. The analysis is based on the information and data presented in the Cultural Resources Overview Report (Ollie et al. 2016). Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts. For information regarding Native American concerns (including TCP), refer to Section 4.3.8.

4.3.2.1 Issues Identified for Analysis

The following are issues identified for analysis during the scoping process for this study.

- Potential direct and indirect adverse effects on archaeological and historic cultural resources, including historic properties and properties of traditional or spiritual importance to tribes, located along the Big Sandy Foothills and Jack Morrow Hills
- Potential direct and indirect adverse effects on National Register eligible historic trails and other linear sites
- Potential direct and indirect adverse effects on specific resources (key resources) identified during the Project scoping and preparation of the EIS (e.g., NHTs, NHT-related sites, NRHP-listed properties, Native American concerns, TCPs, and ACECs with cultural resource components)

For information regarding Native American concerns (including TCP), refer to Section 4.3.8.

4.3.2.2 Types of Potential Effects

The construction, operation, and maintenance of the Project could result in both direct and indirect effects on cultural resources. The types of potential effects on cultural resources include:

- Direct and permanent ground disturbance of cultural resources resulting in damage to intact surface and subsurface cultural materials, such as artifacts and features, during construction of pipelines/Riley Ridge Sweetening Plant and associated facilities, staging stations, and access roads
- Indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility
- Direct and indirect permanent effects on cultural resources, for example vandalism or erosion, due to changes in public accessibility (e.g., unauthorized use of access roads)

4.3.2.3 Criteria for Assessing Impacts

Criteria were developed to assess potential effects on cultural resources associated with the implementation of the Project. Criteria developed to assess potential effects on cultural resources were based on the presence/absence of significant cultural resources (e.g., historic properties and properties of traditional or spiritual importance to tribes or other cultural communities or ethnic groups) that could be encountered along each alternative pipeline route; the nature of potential effects on sites of cultural importance; and the overall density of sites for each of the alternative routes as identified from the literature search.

4.3.2.4 Mitigation Planning

The BLM, in consultation with the Wyoming SHPO, agreed to develop a Programmatic Agreement among the various state and federal agencies and consulting parties with an interest in the Project. In accordance with 36 CFR 800.14(b), a Programmatic Agreement records the terms and conditions agreed upon to resolve the potential adverse effects of an undertaking. The Programmatic Agreement outlines the stipulations that would be followed concerning the identification, assessment, and treatment of historic properties for the Project. Signatories agree that the Project will be administered in accordance with the stipulations set forth in the Programmatic Agreement. To date, the signatory parties include the BLM, the NPS Intermountain Region, the Omaha District of the USACE, the Wyoming SHPO, and the Applicant. Refer to Appendix B for more information.

In compliance with the requirements of Section 106 of the NHPA, as detailed in the Programmatic Agreement for the Project, a Class III cultural resources inventory will be completed for the selected route, prior to initiation of construction. On completion of the Class III inventory, micro-siting of the route will be conducted to avoid and minimize impacts on historic properties to the extent possible. HPTPs for each construction segment will be developed to address any remaining adverse effects resulting from the Project. The purpose of an HPTP is to identify treatments for historic properties that will be adversely affected by construction of a project and to suggest avoidance and mitigation measures to preserve the integrity of these resources or to recover and preserve any information that will be lost by construction of the Project. The HPTP serves as the framework for all fieldwork, analytic, and reporting efforts, providing structure for efforts to mitigate the effects of construction activities on historic properties that are in the path of planned ground disturbance.

Direct impacts on historic properties can be effectively reduced and, in some instances, eliminated through Project design changes. Avoidance is the preferred method to eliminate or reduce adverse effects on historic properties. If avoidance and minimization efforts do not completely resolve adverse effects, the BLM, in consultation with the Applicant, the SHPO, and consulting parties, including the tribes, will ensure that an appropriate HPTP is developed and implemented to mitigate Project-related effects on historic properties. Multiple HPTPs may be developed and implemented individually to reflect the segmentation of the Project.

Initial impacts of the Project may be reduced by the implementation of design features for environmental protection, including implementation of design features of the Proposed Action for environmental protection (Table 2-18). The specific design features for environmental protection relevant to historic properties include:

- **Design Feature 16 (cultural resources). A**pplied to avoid adverse effects or provide for mitigation of historic properties per mitigation measures required by the Programmatic Agreement.
- **Design Feature 17 (cultural and paleontological resources). A**pplied if an unexpected discovery is encountered.

Residual impacts represent anticipated effects on historic properties that would remain after implementation of agency-required mitigation measures (refer to Table 4-2). The agency-required mitigation measures applied to avoid and m inimize effects on historic properties include:

- **Agency-Required Mitigation Measure 1 (sensitive resource avoidance).** Applied to avoid adverse effects on historic properties.
- **Agency-Required Mitigation Measure 8 (interim and intense reclamation).** Applied to rectify the effects of construction and reduce and eliminate the effects over time.
- **Agency-Required Mitigation Measure 9 (minimize new or improved accessibility).** Implemented to limit access to areas and prevent potential vandalism of historic properties.

All mitigation efforts would be in accordance with the Programmatic Agreement negotiated for this Project and would be documented in the HPTP (refer to Appendix B). Any adverse effects (direct or indirect) to NHTs under Section 106 of the NHPA would be mitigated as stipulated in the Programmatic Agreement. The HPTP will be consistent with the Secretary's Standards, the ACHP's Section 106 Archaeology Guidance (2009), all applicable NPS guidance for evaluating and documenting historic properties (e.g., *Guidelines for Evaluating and Documenting Traditional Cultural Properties*, *Guidelines for Evaluating and Documenting Rural Historic Landscapes*), and Wyoming guidelines. As identified in the Programmatic Agreement, the HPTPs would provide the following:

- A brief description of the Proposed Action
- A list of all identified historic properties within the APE
- Identification of specific avoidance, minimization and/or mitigation strategies proposed to address the direct, indirect, and cumulative effects of the Project on historic properties
- A table listing each historic property, including: the property's site number and site name, a brief description of the property, the property's location, the type of disturbance that will affect the historic property, the nature or kind of required treatment measure for the property, and documentation and reporting procedures for each proposed treatment measure

Each HPTP will incorporate Appendix B of the Programmatic Agreement, the Monitoring and Discovery Plan, which is currently being developed by the BLM, the SHPO, and Consulting Parties. In addition, each HPTP will include, as appropriate: public outreach to disseminate the results of research to the general public and to Native American tribes; mitigation measures for every historic property adversely affected by the Project; mitigation measures for adverse effects on NHTs; and mitigation measures to address adverse cumulative effects.

In addition, all blasting work would be conducted in compliance with federal, state, and local laws, rules, and regulations. The Contractor is responsible for obtaining permits to store blasting materials. Blasting will not occur without BLM approval regarding sensitive cultural areas. Procedures and materials used would be identified in the blasting plan provided by the blasting contractor.

4.3.2.5 Results (Direct and Indirect Effects)

A summary of previous cultural resources surveys and known cultural resources sites in the Project study area for each alternative route and alternative route variation is presented in Table 4-28. The percentage of previous cultural resources inventory that has been conducted varies between each of the alternative routes. To facilitate comparison of alternative routes, numbers of potential additional sites were projected for each alternative route. Site projections were calculated based on the average number of sites per 100 acres (site density) for those areas that have been previously inventoried within each 1-mile-wide corridor (Ollie et al. 2016). Table 4-28 presents the known numbers of sites within each 1-mile-wide corridor based on surveyed areas and what the projected number of sites within each 1-mile-wide corridor may be based on the estimated site density.

Table 4-28
Summary of Cultural Resources Surveys and Sites in the Project Study Area

Alternative Route	Miles	Total Acres	Number of Known Sites			Total Number of Known Sites	Total Number of Known Historic Properties	Acres Survey	Percentage of Cultural Resources Survey Coverage	Average Number of Sites per 100 Acres Inventoried	Site Projections[1]	
			Prehistoric	Historic	Multi-Component						Known and Projected Sites	Known and Projected Historic Properties
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant												
1A: Proposed Action	30.4	19,650	141	10	3	154	19	5,937	30	2.59	510	63
1AP Variation: Dry Basin Draw Proposed Action[2]	2.6	2,147	28	1	0	29	4	2,072	96	1.4	30	4
1AV Variation: Dry Basin Draw Variation[2]	2.9	2,320	32	1	0	33	3	2,034	88	1.6	38	3
1B: Dry Piney	34.5	22,355	133	15	4	152	23	11,039	49	1.38	308	47
1C: Figure Four	38.4	24,738	228	21	8	257	53	19,049	77	1.35	334	69
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect												
2A: Proposed Action	129.1	82,757	193	17	26	236	57	5,160	6	4.57	3,785	914
2B: Southern Route	136.2	87,502	202	18	15	235	67	6,647	8	3.54	3,094	882
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect												
3A: Proposed Action	83.2	53,553	179	38	13	230	47	10,247	19	2.24	1,202	246
3B: Lost Creek to Lost Cabin	73.0	47,029	188	57	23	268	50	12,614	27	2.12	999	186
3C: Lost Creek to Highway 20/26	101.4	65,215	231	86	40	357	67	15,615	24	2.29	1,491	280

NOTES:
[1]Site projections were calculated based on the average number of sites per 100 acres (site density) for those areas that have been previously inventoried within each 1-mile-wide corridor (Ollie et al. 2016).
[2]As per cultural analysis presented in Ollie et al. 2016.

For the EIS analysis, the direct effects APE for each alternative route and route variation is evaluated as a 200-foot-wide corridor centered on the reference centerline. This represents a 100-foot- wide avoidance buffer on either side of the reference centerline that subsumes the construction corridor within it for a total corridor width of 200 feet. The number of known sites within the direct effects APE for each alternative route and route variation is driven by the extent of previous Class III cultural resources inventories. Table **4-29** indicates the number of known sites within the direct effects APE for each alternative route and route variation, as well as the number of known historic properties.

The projected number of sites within the direct effects APE can be assessed by using the percentage of unsurveyed areas within each direct effects APE and applying the estimated site density to those areas and adding these findings to the known site totals (Table **4-29**). Available previous inventory shapefiles were used to calculate areas that have been previously inventoried and those without survey data (Ollie et al. 2016). Although the inventory shapefiles do not contain every cultural resources inventory, these data provided the closest way to assess survey coverage in a narrow linear corridor.

It should be noted that known historic properties located in the indirect effects APE that are eligible for the NRHP under Criterion D only are unlikely to be affected by the Project (Table 4-27). These sites would typically not be subject to indirect effects resulting from long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. It is infrequent for a site that is eligible only under Criterion D to have setting as an aspect of integrity.

Table 4-29
Summary of Known and Projected Cultural Sites in the Direct Effects Area of Potential Effects

Alternative Route	Acres	Percentage of Cultural Resources Survey Coverage	Average Number of Sites per 100 Acres Inventoried	Number of Known Sites	Number of Known Historic Properties	Site Projections[1]	
						Number of Known and Projected Sites	Number of Known and Projected Historic Properties
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant							
1A: Proposed Action	736	45	2.59	22	3	32	4
1AP Variation: Dry Basin Draw Proposed Action[2]	63	81	1.40	1	0	1	0
1AV Variation: Dry Basin Draw Variation[2]	71	41	1.62	3	1	4	1
1B: Dry Piney	836	41	1.38	26	5	33	6
1C: Figure Four	931	63	1.35	34	9	39	10
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect							
2A: Proposed Action	3,131	23	4.57	81	28	192	66
2B: Southern Route	3,303	17	3.54	90	31	187	64
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect							
3A: Proposed Action	2,018	27	2.24	64	12	97	18
3B: Lost Creek to Lost Cabin	1,770	36	2.12	106	21	130	26
3C: Lost Creek to Highway 20/26	2,460	42	2.29	101	23	133	30

NOTES:
[1]The projected number of sites in the direct effects APE can be assessed by using the percentage of areas unsurveyed in the direct effects APE and applying the estimated site density to those areas and adding these findings to the known site totals.
[2]As per cultural analysis presented in Ollie et al. 2016.

4.3.2.5.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.2.5.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

4.3.2.5.2.1 Riley Ridge Sweetening Plant Construction

Intensive cultural resources surveys have been completed on 5.4 percent (63.5 acres) of the Riley Ridge Sweetening Plant. The 0.5-mile buffer area for the Riley Ridge Sweetening Plant covers 1,167 acres. There are four known sites, including two historic properties, and one lithic landscape (Yellow Point Ridge [48SU1334]) along this portion of the Project area (Burnett and Ollie 2017). The lithic landscape was determined not eligible for the NRHP. There are no known sites in the direct effects APE for the Riley Ridge Sweetening Plant. The known sites are located on or near the south edge of the 0.5-mile buffer, in the indirect effects APE. With the exception of the lithic landscape, all of the known sites represent prehistoric campsites.

As mentioned earlier, four known sites (excluding the lithic landscape) are in the previous inventoried areas (Burnett and Ollie 2017). If the site density within these previously inventoried areas remained constant (6.3 sites/100 acres), there would be 70 additional sites in the 0.5-mile buffered area, 35 of which would be historic properties (Burnett and Ollie 2017:Table 2). Based on what is known about the greater lithic landscape surrounding the Riley Ridge Sweetening Plant, this appears to be an overestimate and the data from the adjacent RRNP pipeline alternative routes provides what appears to be more reasonable estimates (an average of 2.7 sites per 100 acres [Ollie et al. 2016:Table 10]). Using the average site densities from the pipeline alternative route data, there would be 30 projected sites, 15 of which would be historic properties (Burnett and Ollie 2017:Table 2). Of the projected sites, two sites (including one historic property), would be subject to direct effects from the Project (Burnett and Ollie 2017:Table 3 [estimates using average site densities from adjacent alternative route data]).

No key resources have been identified to date by the tribes, other consulting parties, or the general public.

In accordance with the Programmatic Agreement for the Project, a Class III cultural resource inventory will be required prior to construction. Site-specific avoidance and minimization measures will be instituted, and HPTPs will be developed and implemented for any remaining adverse effects.

Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbance could damage or destroy these resources if not mitigated. If encountered, potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of the Riley Ridge Sweetening Plant and associated ancillary facilities and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads).

4.3.2.5.2.2 Injection Wells

The number of known sites that would potentially be subject to indirect effects along the injection wells is the same as that described for the Riley Ridge Sweetening Plant. Potential impacts on cultural resources from injection wells would be the same as those discussed above for the Riley Ridge Sweetening Plant.

4.3.2.5.2.3 Segment 1 Pipeline Alternative Routes

Alternative 1A: Proposed Action

Intensive cultural resources surveys have been completed on 30 percent (5,937 acres) of Alternative 1A: Proposed Action (Table 4-28). There are 154 known sites along this alternative route, including 19 historic properties. Of the 154 known sites, 22 are in the direct effects APE with 3 of those sites being historic properties (Table 4-29). Only 45 percent of the direct effects APE corridor has been inventoried.

Over the entire length of Alternative 1A: Proposed Action, there is the potential for direct and/or indirect effects on an estimated 510 sites, including 63 estimated historic properties (Table 4-28). Of these sites, 32 sites, including 4 historic properties, would be subject to direct effects from the Project (Table 4-29). In accordance with the Programmatic Agreement for the Project, a Class III cultural resource inventory will be required prior to construction. Site-specific avoidance and minimization measures will be instituted, and HPTPs developed and implemented for any remaining adverse effects.

Key resources along Alternative 1A: Proposed Action are the Opal Wagon Road and the Lander Cutoff of the California NHT (1.3 miles to the northeast). Of these, the Opal Wagon Road is in the direct effects APE. The Opal Wagon Road is crossed by Alternative 1A: Proposed Action. There is the potential for direct effects on unrecorded, significant sites along this alternative route. An area of Native American concern (Chimney Butte landscape) is in proximity to the alternative route (Section 4.3.8). Chimney Butte is located approximately 0.3 mile to the northeast of the alternative route.

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbance could damage or destroy these resources if not mitigated.

Alternative 1A Variations (Dry Basin Draw Proposed Action [1AP] and Dry Basin Draw Variation [1AV])

Intensive cultural resources surveys have been completed on 96 percent (2,072 acres) of Alternative 1AP Variation: Dry Basin Draw Proposed Action (Table 4-28). Twenty-nine sites, including 4 historic properties, have been previously recorded.

Over the entire length of Alternative 1AP Variation: Dry Basin Draw Proposed Action, there is the potential for direct and/or indirect effects on an estimated 30 sites (Table 4-28). The number of historic properties is estimated to remain the same. No key resources have been identified to date by the tribes, other consulting parties, or the general public along this alternative route variation.

In contrast, 88 percent (2,034 acres) of Alternative 1AV Variation: Dry Basin Draw Variation has been inventoried intensively (Table 4-28). Thirty-three sites, including three historic properties, have been previously recorded.

Over the entire length of Alternative 1AV Variation: Dry Basin Draw Variation, there is the potential for direct and/or indirect effects on an estimated 38 sites (Table 4-28). The number of historic properties is estimated to remain the same. No key resources have been identified to date by the tribes, other consulting parties, or the general public along this alternative route variation.

In accordance with the Programmatic Agreement for the Project, a Class III cultural resource inventory will be required prior to construction. Site-specific avoidance and minimization measures will be instituted, and HPTPs developed and implemented for any remaining adverse effects.

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbance could damage or destroy these resources if not mitigated.

Alternative 1B: Dry Piney

Intensive cultural resources surveys have been completed on 49 percent (11,039 acres) of Alternative 1B: Dry Piney (Table 4-28). There are 152 known sites along this alternative route, including 23 historic properties. Of the 152 known sites, 26 are in the direct effects APE with 5 of those sites being historic properties (Table 4-29). Only 41 percent of the direct effects APE corridor has been inventoried.

Over the entire length of Alternative 1B: Dry Piney, there is the potential for direct and/or indirect effects on an estimated 308 sites, including 47 estimated historic properties (Table 4-28). Of these, 33 sites, including 6 historic properties, would be subject to direct effects from the Project (Table 4-29). In accordance with the Programmatic Agreement for the Project, a Class III cultural resource inventory will be required prior to construction. Site-specific avoidance and minimization measures will be instituted, and HPTPs will be developed and implemented for any remaining adverse effects.

Key resources along Alternative 1B: Dry Piney are the same as those identified for Alternative 1A: Proposed Action. The Opal Wagon Road is crossed by Alternative 1B: Dry Piney. There is the potential for direct effects on unrecorded, significant sites along this alternative route.

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbance could damage or destroy these resources if not mitigated.

Alternative 1C: Figure Four

Intensive cultural resources surveys have been completed on 77 percent (19,049 acres) of Alternative 1C: Figure Four (Table 4-28). There are 257 known sites along this alternative route, including 53 historic properties. Of the 257 known sites, 34 are in the direct effects APE with 9 of those sites being historic properties (Table 4-29). Only 63 percent of the direct effects APE corridor has been inventoried.

Over the entire length of Alternative 1C: Figure Four, there is the potential for direct and/or indirect effects on an estimated 334 sites, including 69 estimated historic properties (Table 4-28). Of these sites, 39 sites, including 10 historic properties, would be subject to direct effects from the Project (Table 4-29). In accordance with the Programmatic Agreement for the Project, a Class III cultural resources inventory will be required prior to construction. Site-specific avoidance and minimization measures will be instituted, and HPTPs will be developed and implemented for any remaining adverse effects.

Key resources along Alternative 1C: Figure Four are the same as those identified for Alternative 1A: Proposed Action. The Opal Wagon Road is crossed by Alternative 1C: Figure Four. There is the potential for direct effects on unrecorded, significant sites along this alternative route.

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbance could damage or destroy these resources if not mitigated.

4.3.2.5.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

4.3.2.5.3.1 Alternative 2A: Proposed Action

Intensive cultural resources surveys have been completed on 6 percent (5,160 acres) of Alternative 2A: Proposed Action (Table 4-28). There are 236 known sites along this alternative route, including 57 historic properties. Of the 236 known sites, 81 are in the direct effects APE with 28 of those sites being historic properties (Table 4-29). Only 23 percent of the direct effects APE corridor has been inventoried.

Over the entire length of Alternative 2A: Proposed Action, there is the potential for direct and/or indirect effects on an estimated 3,785 sites, including 914 estimated historic properties (Table 4-28). Of these sites, 192 sites, including 66 historic properties, would be subject to direct effects from the Project (Table 4-29). In accordance with the Programmatic Agreement for the Project, a Class III cultural resources inventory will be required prior to construction. Site-specific avoidance and minimization measures will be instituted, and HPTPs will be developed and implemented for any remaining adverse effects.

Key resources along Alternative 2A: Proposed Action include the NRHP-listed Arapahoe and Lost Creek Site (48SW4882), the Sublette Cutoff of the California NHT, the Emigrant NHTs, the Little Sandy Crossing and the North Sublette Meadow Springs variant of the Sublette Cutoff, the Point of Rocks to South Pass Road, the Bryan to South Pass Stage Road, and the Parting of the Ways (48SW4198). As noted previously, the Parting of the Ways is evaluated out to 4 miles, per BLM request. Of the aforementioned resources, the Arapahoe and Lost Creek Site (48SW4882) and contributing segments of the historic transportation corridors are crossed by this alternative route. While the Point of Rocks to South Pass Road and the Bryan to South Pass Road are crossed once, the Emigrant NHTs is crossed twice by this alternative route. There is the potential for direct effects on unrecorded, significant sites along this alternative route, primarily in the Jack Morrow Hills area. An additional key resource along Alternative 2A: Proposed Action is the Teakettle Dune Field. This active sand dune field is in the direct effects APE. There is potential for unrecorded, significant sites to occur in and around this area.

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbance could damage or destroy these resources if not mitigated.

4.3.2.5.3.2 Alternative 2B: Southern Route

Intensive cultural resources surveys have been completed on approximately 8 percent (6,647 acres) of Alternative 2B: Southern Route (Table 4-28). There are 235 known sites along this alternative route, including 67 historic properties. Of the 235 known sites, 90 are in the direct effects APE with 31 of those sites being historic properties (Table 4-29). Only 17 percent of the direct effects APE corridor has been inventoried.

Over the entire length of Alternative 2B: Southern Route, there is the potential for direct and/or indirect effects on an estimated 3,094 sites, including 882 estimated historic properties (Table 4-28). Of these sites, 187 sites, including 64 historic properties, would be subject to direct effects from the Project (Table 4-29). In accordance with the Programmatic Agreement for the Project, a Class III cultural resources inventory will be required prior to construction. Site-specific avoidance and minimization measures will be instituted, and HPTPs will be developed and implemented for any remaining adverse effects.

Key resources along Alternative 2B: Southern Route are similar to those identified for Alternative 2A: Proposed Action. Sites located along both alternative routes include the NRHP-listed Arapahoe and Lost Creek Site (48SW4882), the Sublette Cutoff of the California NHT, the Emigrant NHTs, the Bryan to South Pass Road, and the Point of Rocks to South Pass Road. Sites identified along this alternative route, but not along Alternative 2A: Proposed Action, include the Boars Tusk (Native American concern) and two NHT-associated sites (Simpson's Hollow and Mormon Knolls). Of the aforementioned resources, only the Arapahoe and Lost Creek Site (48SW4882) and contributing segments of the historic transportation corridors are crossed by Alternative 2B: Southern Route. While the Point of Rocks to South Pass Road and the Bryan to South Pass Road are crossed once, the Emigrant NHTs is crossed twice by this alternative route. The Boars Tusk is in the indirect effects APE (approximately 128 meters north of the alternative route). There is the potential for direct effects on unrecorded, significant sites along this alternative route. Refer to Section 4.3.8 for further discussion of potential impacts associated with the Boars Tusk.

Additional key resources along Alternative 2B: Southern Route are the West Sand Dunes Archaeological District and the Greater Sand Dunes ACEC. The Greater Sand Dunes ACEC is in the direct effects APE. This alternative route crosses the West Sand Dunes Archaeological District. Refer to Section 4.3.16 for further discussion of potential impacts associated with these resources.

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbance could damage or destroy these resources if not mitigated.

4.3.2.5.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

4.3.2.5.4.1 Alternative 3A: Proposed Action

Intensive cultural resources surveys have been completed on 19 percent (10,247 acres) of Alternative 3A: Proposed Action (Table 4-28). There are 230 known sites along this alternative route, including 47 historic properties. Of the 230 known sites, 64 are in the direct effects APE with 12 of those sites being historic properties (Table 4-29). Only 27 percent of the direct effects APE corridor has been inventoried.

Over the entire length of Alternative 3A: Proposed Action, there is the potential for direct and/or indirect effects on an estimated 1,202 sites, including 246 estimated historic properties (Table 4-28). Of these sites, 97 sites, including 18 historic properties, would be subject to direct effects from the Project (Table 4-29). In accordance with the Programmatic Agreement for the Project, a Class III cultural resources inventory will be required prior to construction. Site-specific avoidance and minimization measures will be instituted, and HPTPs will be developed and implemented for any remaining adverse effects.

Key resources along Alternative 3A: Proposed Action include Crooks Gap Stage Station, Home on the Range Stage Station, the Rawlins to Fort Washakie Road, the Emigrant NHTs, the Bridger Trail, and several NHT-related sites (e.g., Three Crossings Stage Station and multiple crossings of the Sweetwater River). Of these resources, the stage stations, the Rawlins to Fort Washakie Road, the Bridger Trail, and contributing segments of the Emigrant NHTs are crossed by Alternative 3A: Proposed Action. There is the potential for direct effects on unrecorded, significant sites along this alternative route, primarily within the boundaries of the Crooks Gap–Sheep Mountain area. Additionally, there is the potential for direct or indirect effects on unrecorded, significant sites associated with a resource of Native American concern (Cedar Ridge TCP [Section 4.3.8]).

Regarding the Rawlins to Fort Washakie Road, Project-related impacts are expected to be low. The BLM and SHPO have concurred that the setting in this area has been compromised due to previous development of infrastructure (e.g., power lines, pipelines, and mining). Therefore, setting is no longer an aspect of integrity for segments of the historic road through the Crooks Gap–Sheep Mountain area.

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbance could damage or destroy these resources if not mitigated.

4.3.2.5.4.2 Alternative 3B: Lost Creek to Lost Cabin

Intensive cultural resources surveys have been completed on 27 percent (12,614 acres) of Alternative 3B: Lost Creek to Lost Cabin (Table 4-28). There are 268 known sites along this alternative route, including 50 historic properties. Of the 268 known sites, 106 are in the direct effects APE with 21 of those sites being historic properties (Table 4-29). Only 36 percent of the direct effects APE corridor has been inventoried.

Over the entire length of Alternative 3B: Lost Creek to Lost Cabin, there is the potential for direct and/or indirect effects on an estimated 999 sites, including 186 estimated historic properties (Table 4-28). Of these sites, an estimated 130 sites, including 26 historic properties, would be subject to direct effects from the Project (Table 4-29). In accordance with the Programmatic Agreement for the Project, a Class III cultural resources inventory will be required prior to construction. Site-specific avoidance and minimization measures will be instituted, and HPTPs will be developed and implemented for any remaining adverse effects.

Key resources along Alternative 3B: Lost Creek to Lost Cabin are the same as those identified for Alternative 3A: Proposed Action. There is the potential for direct effects on unrecorded, significant sites along this alternative route, primarily within the boundaries of the Crooks Gap–Sheep Mountain area. A

significant resource of Native American concern (Cedar Ridge TCP) is in the vicinity of the alternative route (Section 4.3.8).

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbance could damage or destroy these resources if not mitigated.

4.3.2.5.4.3 Alternative 3C: Lost Creek to Highway 20/26

Intensive cultural resources surveys have been completed on approximately 24 percent (15,615 acres) of Alternative 3C: Lost Creek to Highway 20/26 (Table 4-28). There are 357 known sites along this alternative route, including 67 historic properties. Of the 357 known sites, 101 are in the direct effects APE with 23 of those sites being historic properties (Table 4-29). Only 42 percent of the direct effects APE corridor has been inventoried.

Over the entire length of Alternative 3C: Lost Creek to Highway 20/26, there is the potential for direct and/or indirect effects on an estimated 1,491 sites, including 280 estimated historic properties (Table 4-28). Of these, 133 sites, including 30 historic properties, would be subject to direct effects from the Project (Table 4-29). In accordance with the Programmatic Agreement for the Project, a Class III cultural resources inventory will be required prior to construction. Site-specific avoidance and minimization measures will be instituted, and HPTPs will be developed and implemented for any remaining adverse effects.

Key resources along Alternative 3C: Lost Creek to Highway 20/26 are the same as those identified for Alternative 3A: Proposed Action, except for two additional resources (the NHRP-listed Waltman Crossing [48NA561] and Powder River Train Station [48NA808]). Alternative 3C: Lost Creek to Highway 20/26 does not cross any known contributing segments of the Bridger Trail. There is the potential for direct effects on unrecorded, significant sites along this alternative route, primarily within the boundaries of the Crooks Gap–Sheep Mountain area.

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbance could damage or destroy these resources if not mitigated.

4.3.2.5.4.4 230-Kilovolt Transmission Line

The number of cultural resources that would potentially be subject to direct and/or indirect effects along this transmission line is unknown at this time. A literature search and a Class III cultural resources inventory of the transmission line location would be required to determine potential direct and indirect effects on cultural resources. Cultural resources analysis is pending the BLM's receipt of the right-of-way application from PacifiCorp.

4.3.2.5.5 Mainline Valve Distribution Lines

The number of cultural resources that would potentially be subject to direct and/or indirect effects along the MLV distribution sites is unknown at this time. A literature search and a Class III cultural resources inventory of final locations of MLV distribution lines would be required to determine potential direct and indirect effects on cultural resources.

4.3.2.6 Summary Comparison of Alternative Routes

4.3.2.6.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

In Segment 1, Alternative 1A: Proposed Action is the shortest of the alternative routes and, therefore, would affect fewer acres of land during construction, maintenance, and operation of the Project (Table 4-28). Of the three alternative routes, Alternative 1A: Proposed Action has received the least cultural resources survey coverage (30 percent), followed by Alternative 1B: Dry Piney (49 percent). Alternative 1C: Figure Four (77 percent) has received the most survey coverage. However, while percentage of cultural resources survey coverage is low under Alternative 1A: Proposed Action, this alternative route has the greatest number of known sites per 100 acres inventoried (n=2.59), followed by Alternative 1B: Dry Piney (n=1.38). Alternative 1C: Figure Four is the most inventoried, yet it has much lower site density (n=1.35).

Based on areas with existing inventories, Alternative 1B: Dry Piney would potentially impact the lowest number of known sites, closely followed by Alternative 1A: Proposed Action. Alternative 1C: Figure Four would potentially impact the highest number of known sites in areas with existing inventories. In addition, Alternative 1A: Proposed Action has the fewest number of known sites in the direct effects APE, followed by Alternative 1B: Dry Piney and Alternative 1C: Figure Four, respectively. Class III inventory would likely result in more and/or different types of sites recorded along the alternative routes.

Site projections, based on areas with existing inventories, indicate that Alternative 1B: Dry Piney is expected to have the fewest number of sites, followed by Alternative 1C: Figure Four and Alternative 1A: Proposed Action, respectively. Nevertheless, Alternative 1A: Proposed Action is expected to have the fewest number of sites in the direct effects APE, closely followed by Alternative 1B: Dry Piney. Alternative 1C: Figure Four is expected to have the highest number of sites in the direct effects APE.

All three alternative routes have the same key resources, the Opal Wagon Road and the Lander Cutoff of the California NHT. All three alternative routes cross the Opal Wagon Road and are within the viewshed of the Lander Cutoff of the California NHT. Alternative 1A: Proposed Action is in proximity to an area of Native American concern (Chimney Butte landscape) in the indirect effects APE (refer to Section 4.3.8). Chimney Butte is located approximately 0.3 mile to the northeast of the alternative route. The other alternative routes avoid this sensitive area.

Alternative 1AP Variation: Dry Basin Draw Proposed Action is the shorter of the two route variations for Alternative 1A: Proposed Action's and, therefore, would affect fewer acres of land during construction, maintenance, and operation of the Project (Table 4-28). Of the two route variations, Alternative 1AP Variation: Dry Basin Draw Proposed Action has received more cultural resources survey coverage (96 percent), but it has the lower number of known sites per 100 acres inventoried (n=1.4). Alternative 1AV Variation: Dry Basin Draw Variation has received less cultural resources survey coverage (88 percent), yet it has a slightly higher site density (n=1.6). Based on areas with existing inventories, Alternative 1AP Variation: Dry Basin Draw Proposed Action would potentially impact the lowest number of known sites. Additional Class III inventory would likely result in more and/or different types of sites recorded along the alternative routes.

Site projections, based on areas with existing inventories, indicate that Alternative 1AP Variation: Dry Basin Draw Proposed Action is expected to have a lower number of sites than Alternative 1AV Variation: Dry Basin Draw Variation.

Where direct and indirect effects are determined to be adverse, appropriate measures would be implemented to avoid, minimize, or mitigate those effects. All mitigation efforts would be in accordance with the Programmatic Agreement negotiated for this Project and would be detailed in the HPTP.

4.3.2.6.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

In Segment 2, Alternative 2A: Proposed Action is the shorter of the two alternative routes and, therefore, would affect fewer acres of land during construction, maintenance, and operation of the Project (Table 4-28). Of the two alternative routes, Alternative 2A: Proposed Action has received less cultural resources survey coverage (6 percent), but it has the greater number of known sites per 100 acres inventoried (n=4.57). Alternative 2B: Southern Route has more inventoried sites (8 percent), yet it has much lower site density (n=3.54).

Based on areas with existing inventories, Alternatives 2A: Proposed Action and 2B: Southern Route would potentially impact a similar number of known sites. Of the two alternative routes, Alternative 2A: Proposed Action has the lower number of known sites in the direct effects APE. Additional Class III inventory would likely result in more and/or different types of sites recorded along the alternative routes.

Site projections, based on areas with existing inventories, indicate that Alternative 2B: Southern Route is expected to have a lower number of sites than Alternative 2A: Proposed Action. Alternative 2B: Southern Route is also expected to have the lower number of sites in the direct effects APE.

The two alternative routes have the same key resources. However, Alternative 2A: Proposed Action has four additional resources (the Little Sandy Crossing of the Sublette Cutoff, North Sublette Meadows Spring variant of the Sublette Cutoff, Parting of the Ways [48SW4198], and Teakettle Dune Field). Alternative 2A: Proposed Action crosses the southern portion of the Teakettle Dune Field. There is the potential for direct effects on unrecorded, significant sites in and around this area. Though the Parting of the Ways (48SW4198) is within the designated 4-mile viewshed, visibility of the pipeline corridor at ground level over a distance of 4 miles would be negligible.

Specific to Alternative 2B: Southern Route are the Boars Tusk in the indirect effects APE (refer to Section 4.3.8), and the West Sand Dunes Archaeological District and the Greater Sand Dunes ACEC in the direct effects APE. There is the potential for direct effects on unrecorded, significant sites along this alternative route.

Key resources shared by both alternative routes include the Bryan to South Pass Stage Road, the Point of Rocks to South Pass Road, the NRHP-listed Arapahoe and Lost Creek site (48SW4882), the Emigrant NHTs (including NHT-associated sites), and the Sublette Cutoff of the California NHT. There is the potential for unrecorded, significant sites in the Jack Morrow Hills area. Alternative 2A: Proposed Action and Alternative 2B: Southern Route cross the NRHP-listed Arapahoe and Lost Creek Site (48SW4882) and the aforementioned historic transportation corridors.

Where direct and indirect effects are determined to be adverse, appropriate measures would be implemented to avoid, minimize, or mitigate those effects. All mitigation efforts would be in accordance with the Programmatic Agreement negotiated for this Project and would be detailed in the HPTP.

It should be noted that portions of the Segment 2 alternative routes in the Lander Field Office will be in existing utility corridors (Bairoil [below ground], Frontier [below ground], and Lost Creek [above ground or below ground]).

4.3.2.6.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

In Segment 3, Alternative 3B: Lost Creek to Lost Cabin is the shortest of the alternative routes and, therefore, would affect a smaller number of acres of land during construction, maintenance, and operation of the Project (Table 4-28). Of the three alternative routes, Alternative 3A: Proposed Action has received the least cultural resources survey coverage (19 percent), followed by Alternative 3C: Lost Creek to Highway 20/26 (24 percent), then Alternative 3B: Lost Creek to Lost Cabin (27 percent) with the most survey coverage. Based on the number of known sites per 100 acres inventoried, Alternative 3B: Lost Creek to Lost Cabin has the lowest site density (n=2.12), closely followed by Alternative 3A: Proposed Action (n=2.24). Alternative 3C: Lost Creek to Highway 20/26 has the highest site density (n=2.29).

Based on areas with existing inventories, Alternative 3A: Proposed Action would potentially impact the lowest number of known sites, followed by Alternative 3B: Lost Creek to Lost Cabin. Alternative 3C: Lost Creek to Highway 20/26 would potentially impact the highest number of known sites in areas with existing inventories. In addition, Alternative 3A: Proposed Action has the fewest number of known sites in the direct effects APE, followed by Alternative 3C: Lost Creek to Highway 20/26 and Alternative 3B: Lost Creek to Lost Cabin. Additional Class III inventory would likely result in more and/or different types of sites recorded along the alternative routes.

Site projections, based on areas inventories, indicate that Alternative 3B: Lost Creek to Lost Cabin is expected to have the fewest number of sites, followed by Alternative 3A: Proposed Action and Alternative 3C: Lost Creek to Highway 20/26, respectively. Nevertheless, Alternative 3A: Proposed Action is expected to have the lowest number of sites in the direct effects APE, followed by Alternative 3B: Lost Creek to Lost Cabin. Alternative 3C: Lost Creek to Highway 20/26 is expected to have the highest number of sites in the direct effects APE.

All three alternative routes have the same key resources, with the exception of two additional sites along Alternative 3C: Lost Creek to Highway 20/26 (NRHP-listed Waltman Crossing [48NA561] and NRHP-listed Powder River Train Station [48NA808]). Key resources shared by all three alternative routes include the Crooks Gap Station, Home on the Range Stage Station, Rawlins to Fort Washakie Road, Emigrant NHTs (including NHT-associated sites), and Bridger Trail. There is the potential for unrecorded, significant sites in the Crooks Gap-Sheep Mountain area. The Rawlins to Fort Washakie Road, the Emigrant NHTs, and the Bridger Trail are crossed by all three alternative routes.

Several sites associated with a resource of Native American concern (Cedar Ridge TCP) are in proximity to Alternative 3A: Proposed Action. In addition, Cedar Ridge TCP and its periphery are located approximately 5 miles to the northeast of Alternative 3B: Lost Creek to Lost Cabin (refer to Section 4.3.8).

Where direct and indirect effects are determined to be adverse, appropriate measures would be implemented to avoid, minimize, or mitigate those effects. All mitigation efforts would be in accordance with the Programmatic Agreement negotiated for this Project and would be detailed in the HPTP.

It should be noted that the Segment 3 alternative routes will be in existing utility corridors in the Lander Field Office (Bairoil [below ground], Frontier [below ground], Highway 20/26 [overhead or below ground], Lost Creek [overhead or below ground], and Sand Draw to Casper [overhead or below ground]) and in the Casper Field Office (D6067, 6068, and Cabin Creek utility corridors).

4.3.3 Fish and Aquatic Resources

4.3.3.1 Issues Identified for Analysis

Issues related to fish and aquatic resources identified during agency and public scoping include:

- Protection and conservation of species and critical habitat listed in Section 4 of the ESA, as stated in Section 7 of the ESA
- Minimization of sediments into waterbodies with native trout and waterbodies suitable for expansion and reintroduction of native trout and other coldwater fish species
- Potential to disseminate invasive and noxious species
- Protection and conservation of habitat for BLM sensitive species
- Management of fish and invasive species in compliance with BLM RMPs and policies

4.3.3.2 Types of Potential Effects

The types of potential direct effects of the Project on fish and aquatic resources habitats include:

- Water quality or thermal related mortality
- Permanent and temporary habitat loss
- Effects on habitat use through behavioral modifications resulting in habitat use displacement, including disruption of reproduction, foraging, and predation
- Disruption to fish and aquatic organism passage and migration
- Introduction of invasive and noxious aquatic species

The Project may also result in indirect effects, including habitat fragmentation, population decline or changes, and loss of genetic integrity as a result of individual mortality. Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.3.3 Criteria for Assessing Impacts

Criteria were developed in collaboration with the BLM interdisciplinary team to assess the level of potential effects on fish and aquatic resources. Criteria developed to assess the level of impacts were based on considerations of fish and aquatic resource vulnerability to impacts; relative fish and aquatic species population abundance and the magnitude of anticipated impacts; additional protections, including state laws and statutes; and existing conditions. Table 4-30 describes the criteria developed to assess the level of impacts on fish and aquatic resources.

Table 4-30
Criteria for Assessing Level of Impacts on Fish and Aquatic Species

Level of Impacts	Description
High	▪ Permanent loss of in-stream habitat ▪ Water quality related impairment of fish habitat from sedimentation and turbidity ▪ Disruption of spawning ▪ Inadequate water supply for fish related to consumptive use of water
Moderate	▪ Indirect effects on downstream water quality during construction
Low	▪ Temporary effects on in-stream habitat ▪ Indirect effects or disturbance in areas of preexisting in-stream disturbance

4.3.3.4 Mitigation Planning

Initial impacts are those effects resulting from the implementation of the Project, including implementation of design features of the Proposed Action for environmental protection (Table 2-18).

Initial impacts were assigned using the criteria presented in Table 4-30. The specific design features of the Proposed Action for environmental protection relevant to fish and aquatic resources include:

- **Design Feature 26 (waste management wastewater).** Applied to any wastewater generated in association with temporary, portable sanitary facilities.
- **Design Feature 27 (water – stormwater pollution prevention plan).** Applied prior to commencement of construction to ensure proper sediment and erosion control and reporting procedures are followed.
- **Design Feature 28 (water – road drainage).** Applied to avoid or minimize damage to water-delivery infrastructure and/or interference with delivery of water.
- **Design Feature 29 (waters – waterbodies and wetlands).** Applied where waters of the U.S., including wetlands, would need to be avoided to the maximum extent practicable. Where these features cannot be completely avoided, impacts would be minimized through design modification, as needed. Facilities (e.g., flowlines and staging areas) would be sited to avoid and/or minimize impacts; however, where impacts are anticipated, measures would be employed to minimize impacts (e.g., use of culverts to maintain downstream flow/drainage). This design feature would be applied to avoiding water courses and wetlands and minimizing and/or reducing potential for impacts on riparian areas and water courses by siting project facilities outside of these areas.
- **Design Feature 30 (water – waterbodies and wetlands [construction]).** Applied to any construction that is in or adjacent to wetlands and streams and would use Applicant-committed BMPs listed to protect surface water quality and to minimize impacts on those resources.
- **Design Feature 31 (water – control of aquatic invasive species).** Applied to avoid, reduce, and/or minimize the potential for the spread of AIS.

Residual impacts represent anticipated effects on fish and aquatic resources that would remain after implementation of agency-required mitigation measures (refer to Table 4-2). The level of potential residual impacts on fish and aquatic resources associated with implementation of the Project was assessed using the criteria presented in Table 4-30. The agency-required mitigation measures applied to avoid, reduce, or minimize impacts on fish and aquatic resources include:

- **Agency-Required Mitigation Measure 1 (sensitive resource avoidance).** Applied to avoid mortality, in-stream habitat loss, disruption of spawning or passage, or water quality impacts. This includes BLM Rawlins RMP Appendix 13 advisory on Reducing Non-point Source Pollution Using Best Management Practices, in particular for working in or near streams and waterbodies. Crucial streams and red and blue ribbon trout streams would be subject to HDD to avoid moderate and high impacts. The advantage of HDD is minimal surface impact, limited to the established entry (typically 25 feet by 50 feet) and exit (typically 15 feet by 20 feet) locations for drilling equipment typically located outside the resource.
- **Agency-Required Mitigation Measure 7 (seasonal restrictions).** Applied when seasonal restrictions on construction activities are needed to avoid temporally sensitive periods, including spawning. WGFD seasonal restrictions on residual work activities during spawning in or near the beds of crucial and red/blue ribbon trout streams would be contingent on the species present and would be developed in coordination with WGFD regional fishery managers.

Table 4-31 includes crucial streams and red and blue ribbon trout streams affected by the implementation of the Project, initial and residual impacts, and the agency-required mitigation measures to be used.

Table 4-31 Summary of Initial and Residual Impacts on Fish and Aquatics Resources			
Resource	**Initial Impact**	**Agency-Required Mitigation Measure**	**Residual Impact**
Crucial streams and red and blue ribbon trout streams	Moderate	1, 7	Low
NOTE: Initial impacts reflect implementation of the design features of the Proposed Action for environmental protection, which are considered to be part of the Applicant's Project description (and include the Applicant-committed measures [Appendix A]). Residual impacts reflect the anticipated effects that would remain after implementation of agency-required mitigation measures.			

4.3.3.5 Results (Direct and Indirect Residual Effects)

Table 4-32 shows the Project effects and residual impacts on crucial streams and red and blue ribbon trout streams for each alternative route. Project effects are shown in MV-12.

Table 4-32 Crucial and Red and Blue Ribbon Trout Streams Inventory Data and Residual Impacts				
Alternative	**Total Miles**	**Crucial and Trout Streams (miles crossed)**	**Residual Impacts (miles crossed)[1]**	
			None	**Low**
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant				
1A: Proposed Action	30.4	0.3	30.1	0.3
1A: Variation: Dry Basin Draw	30.7	0.3	30.4	0.3
1B: Dry Piney	34.5	0.3	34.2	0.3
1C: Figure Four	38.5	0.2	38.3	0.2
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect				
2A: Proposed Action	129.1	0.1	129.0	0.1
2B: Southern Route	136.2	0.0	136.2	0.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect				
3A: Proposed Action	83.2	0.0	83.2	0.0
3B: Lost Creek to Lost Cabin	73.0	0.0	73.0	0.0
3C: Lost Creek to Highway 20/26	101.4	0.0	101.4	0.0
NOTE: [1]No moderate or high residual impacts are anticipated.				

During construction, crucial streams and red and blue ribbon trout streams shown in MV-12 would be avoided by HDD under the river/stream bed. Thus, impacts on these resources would be avoided or minimized (refer to Section 4.3.3.2). Due to the nature of HDD, the potential for frac-outs exists. Frac-out occurs when drilling fluid is released during installation, which can occur when pressure in the drill hole is not maintained and a loss of circulation of drilling fluids occurs. Biological monitoring for frac-outs would be required during the HDD operations. Monitoring would include inspecting the water column above and downstream for frac-outs of drilling mud into the river or stream for any follow-up hazard remedial responses in accordance with state and federal standards. Monitoring and the response protocols described in the POD will avoid the potential for moderate or high impacts. With monitoring, small indicators of frac releases would be detected and immediately remediated to prevent the frac plume from enlarging to the scale and scope of a regulated discharge.

The use of HDD and adherence to seasonal restrictions on construction and maintenance activities would avoid or minimize the spread of invasive and noxious aquatic species, as well as potential impediments to spawning. HDD would avoid work in the stream, river, or waterbody and would subsequently avoid the potential for transmission of invasive and noxious species with equipment and stream crossings. Similarly, HDD would avoid work in the stream, river, or waterbody where construction activities could

result in disruption or prevention of spawning. In addition, construction using HDD would avoid impacts on fish and aquatic resources in the Green River, such as sedimentation into fisheries, including waterbodies with native trout and waterbodies suitable for expansion and reintroduction of native trout and other cold water fish species.

As proposed, all permitted uses of hydrostatic test water used from natural sources would be returned to the watershed in accordance with CWA discharge standards. Hydrostatic test water would not be transported between or outside of the sourced Colorado River and Platte River watersheds.

The USFWS defines impacts on federally listed fish species and their critical habitat under the Colorado River Fish Recovery Program stating "…any amount of water removed from the Colorado River system is considered to be a depletion of water, and amounts greater than 0.1 acre-feet per year require formal consultation with the USFWS for downstream impacts on threatened and endangered species." There are no ESA threatened or endangered fish, WYNDD occurrences, or critical habitats in the Project area. The critical habitat for Colorado River fish is located downstream in the watershed. Fish in these critical habitats require adequate and naturally timed upstream water availability, as well as good water quality, to survive and recover as protected species.

Impacts on federally listed fish other listed species and their critical habitat in the Platte River Implementation Program are defined as "any construction activities that have the potential to increase or decrease water levels" and must be offset in accordance with Wyoming and the USFWS "depletions plans." There are no known occurrences of Platte River ESA threatened or endangered species or critical habitats in the Project area. The critical habitat for Platte River listed species is located downstream in the watershed. Species in these critical habitats require adequate and naturally timed upstream water availability, as well as good water quality, to survive and recover as protected species.

4.3.3.5.1 Aquatic Resources

4.3.3.5.1.1 No Action Alternative

Under the No Action Alternative, a right-of-way grant across BLM-administered lands would not be granted. The Project would not be developed and the environment would remain as it presently exists.

4.3.3.5.1.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction

Potential impacts on fish and aquatic resources are related to Project construction, operations, and maintenance. Indirect effects on fish and aquatic resources could be attributed to accidental spills of environmentally harmful substances including oil, gas, mechanical fluids, concrete wastes, or pesticides. To reduce the potential for adverse effects from environmentally harmful substances, the Applicant would follow Appendix K of the POD— Hazardous Materials Management and Spill Prevention, Control, and Countermeasures Plan (Appendix A).

Water is needed during the construction of the Riley Ridge Sweetening Plant, refer to Section 4.3.20 for further information on water resources. The rights for use of water for hydrostatic testing and fugitive dust control purposes would be obtained, as needed, prior to construction through permits or purchase contracts with owners of valid existing water rights under the Wyoming Water Rights permitting process. Because the exact water source is not yet known, the impacts on specific fish and aquatic resources from construction activity is not known at this time. Table 2-11 and Table 2-12 detail the anticipated water uptake and sources for construction activities.

Injection Wells

Potential impacts on fish and aquatic resources from injection wells would be the same as those discussed above for the Riley Ridge Sweetening Plant. Refer to Section 4.3.20 for further information on water resources.

Segment 1 Pipeline Alternative Routes

All alternative routes in Segment 1 cross the Green River, a crucial stream and a red ribbon trout stream. Construction using HDD would avoid impacts on fish and aquatic resources in the Green River. Based on the impact criteria used in this analysis (Table 4-30), the use of HDD is expected to reduce residual impacts on the Green River to low levels (Table 4-31).

All alternative routes considered in Segment 1 cross two WGFD aquatic conservation areas, Green River/Birch Creek and Green River/Beaver Creek, as well as an aquatic crucial priority area, Trail Ridge – Upper Beaver Watershed. Potential effects on these resources are described in Section 4.3.3.2. Design features of the Proposed Action to reduce the spread of noxious weeds or invasive aquatic species, sedimentation, and possible contamination of water resources are expected to reduce impacts on these resources. Additionally, any crossing or construction activities adjacent to a stream would be conducted per Applicant-committed BMPs, which are described in greater detail in Appendix G of the POD (Appendix A). The exact types of crossings employed at specific resources are not available for this analysis but will be detailed in the POD developed for Project construction, which would be subjected to agency review and approval prior to any construction activities.

All alternative routes considered in Segment 1 cross two WGFD aquatic conservation areas, Green River/Birch Creek and Green River/Beaver Creek, as well as an aquatic crucial priority area, Trail Ridge – Upper Beaver Watershed. Potential effects on these resources are described in Section 4.3.3.2. Design features of the Proposed Action to reduce the spread of noxious weeds or invasive aquatic species, sedimentation, and possible contamination of water resources are expected to reduce impacts on these resources. Additionally, any crossing or construction activities adjacent to a stream would be conducted per Applicant-committed BMPs, which are described in greater detail in Appendix G of the POD (Appendix A). The exact types of crossings employed at specific resources are not available for this analysis but will be detailed in the POD developed for Project construction, which would be subjected to agency review and approval prior to any construction activities.

4.3.3.5.1.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Only Alternative 2A: Proposed Action crosses a crucial stream, the Big Sandy River. Construction using HDD would reduce impacts on fish and aquatic resources in the Big Sandy River. Based on the impact criteria used in this analysis (Table 4-30), the use of HDD is expected to reduce residual impacts on the Big Sandy River to low levels (Table 4-31).

Both Alternatives 2A: Proposed Action and 2B: Southern Route cross the Birch Creek-Green River aquatic conservation area. Alternative 2A: Proposed Action crosses another two aquatic conservation areas, the Upper Big Sandy River and Little Sandy Creek. The Upper Big Sandy River is also a WGFD aquatic crucial priority area. Project impacts and mitigation measures to reduce these impacts would be similar to those described for Segment 1.

4.3.3.5.1.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

No crucial streams, red or blue ribbon trout streams, or aquatic conservation areas are crossed or in the downstream receiving watersheds of the alternative routes considered in Segment 3. Thus, no identifiable impacts from implementation of the Project would be anticipated on the fish and aquatic resources.

4.3.3.5.2 Special Status Fish Species

Two BLM sensitive species, bluehead sucker and flannelmouth sucker, as well as a core conservation population of Colorado River cutthroat trout, are known to exist in the Project study area (refer to Section 3.2.3.3). The Project would be in the upstream watershed of federally listed fish species in the Colorado River (to the southwest), which may host the federally endangered humpback chub, bonytail, Colorado pikeminnow, and razorback sucker. The Project also would be in the upstream watershed of the Platte River (to the east), which may host the federally listed pallid sturgeon. The potential effects of the Project on these species are discussed in this section. Discussion of Platte River federally listed species includes all species covered under the Platte River Recovery Implementation Plan.

4.3.3.5.2.1 No Action Alternative

Under the No Action Alternative, a right-of-way grant across BLM-administered lands would not be issued. The Project would not be developed and the environment would remain as it presently exists.

4.3.3.5.2.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction

Potential impacts on special status fish species from the proposed Riley Ridge Sweetening Plant are the same as those discussed under Section 4.3.3.5.1.

Injection Wells

Potential impacts on special status fish species from the proposed injection wells are the same as those discussed under Section 4.3.3.5.1.

Segment 1 Pipeline Alternative Routes

All alternative routes considered in Segment 1 cross Beaver Creek and Spring Creek, which support a core conservation population of Colorado River cutthroat trout. Where alternative routes cross these streams, or conduct ground-disturbing activities adjacent to these streams, potential direct and indirect effects on cutthroat trout may occur. These effects are described in Section 4.3.3.2. Design features of the Proposed Action for environmental protection are expected to reduce impacts on cutthroat trout, through reducing the spread of noxious weeds or invasive aquatic species, sedimentation, and possible contamination of water. Additionally, any crossing or construction activities adjacent to these streams would be conducted according to Applicant-committed BMPs, which are described in greater detail in Appendix G of the POD (Appendix A). The exact types of crossings employed at specific waterbodies are not available for this analysis but will be detailed in the POD developed for Project construction, which would be subject to agency review and approval prior to any construction activities. These mitigation measures are expected to prevent degradation to cutthroat trout habitat and limit residual impacts.

All alternative routes in Segment 1 are located within a watershed regulated for downstream depletions to the Colorado River to protect federally listed fish species and critical habitat. Water withdrawals and downstream depletions may affect flow regimes crucial for maintaining habitat for these species. The extent and potential effects of Project-related water withdrawals are discussed in greater detail in Section

4.3.20. Mitigation to reduce water depletion impacts on Colorado River fish species could include a commitment to avoiding water withdrawals from certain waterbodies or contributions to a mitigation fund consistent with the Upper Colorado River Recovery Program. The exact mitigation measures to reduce impacts would be developed on a species-specific basis during Section 7 consultation with the USFWS.

4.3.3.5.2.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Both Alternatives 2A: Proposed Action and 2B: Southern Route cross Big Sandy River where it is known to contain the BLM sensitive flannelmouth sucker. Additionally, Alternative 2A: Proposed Action crosses the Big Sandy River at a location also known to contain the BLM sensitive bluehead sucker (WGFD 2005). Where the Project crosses or conducts ground-disturbing activities adjacent to streams containing BLM sensitive fish species, potential direct and indirect effects on these species may occur. These effects are described in Section 4.3.3.2. Design features of the Proposed Action for environmental protection are expected to reduce impacts on sensitive fish species through reducing the spread of noxious weeds or invasive aquatic species, sedimentation, and possible contamination of water. Additionally, any crossing or construction activities adjacent to these streams would be conducted per Applicant-committed BMPs, which are described in greater detail in Appendix G of the POD (Appendix A). The exact types of crossings employed at specific waterbodies are not available for this analysis but will be detailed in the POD developed for Project construction, which would be subject to agency review and approval prior to any construction activities. These mitigation measures are expected to prevent habitat degradation, reduce potential fish mortality, and limit residual impacts.

The western portions of Alternative 2A: Proposed Action and Alternative 2B: Southern Route are located within a watershed regulated for downstream depletions to the Colorado River to protect federally listed fish species and critical habitat. The potential effects and mitigation to reduce impact on these species would be similar to those described for Segment 1.

4.3.3.5.2.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

All alternative routes in Segment 3 are located within a watershed regulated for downstream depletions to the Platte River to protect federally listed species dependent on certain flow regimes to maintain habitat. Water withdrawals and downstream depletions may affect these flow regimes and negatively affect habitat for these federally listed species. The extent and potential effects of Project-related water withdrawals are discussed in greater detail in Section 4.3.20. Mitigation to reduce water depletion impacts on Platte River species could include a commitment to avoiding water withdrawals from certain waterbodies or offset water withdrawals consistent with the Wyoming Depletions Plan. The exact mitigation measures to reduce impacts would be developed on a species-specific basis during Section 7 consultation with the USFWS.

4.3.3.5.2.5 230-Kilovolt Transmission Line

The 230kV transmission line for the Riley Ridge Sweetening Plant is not located near any waterbodies with fish or aquatic resources. Indirect effects on downstream water quality during construction will be minimized through erosion control and other water quality BMPs.

4.3.3.5.2.6 Mainline Valve Distribution Lines

The locations of the approximately 24 distribution lines that would be required to power the MLVs along the pipeline are not known but are assumed and are described in Chapter 2. The transmission line tower spacing and siting will be adjustable to avoid direct impacts on fish and aquatic resource habitats. Indirect impacts will be minimized through erosion control BMPs during construction of the tower pads and

ancillary access road. All associated distribution line construction access roads will be reclaimed. Residual direct impacts on fish and aquatic resources could be minimized through burial of the distribution line or by use of solar power at the MLVs. Burial or solar power would avoid direct impacts in waterbodies with fish populations and aquatic resources.

4.3.3.6 Summary Comparison of Alternative Routes

In Segment 1, all alternative routes would avoid impacts on fish and aquatic resources in the Green River using HDD. All alternative routes cross aquatic conservation areas, aquatic crucial priority areas, and streams supporting a core conservation population of Colorado River cutthroat trout, and potential disturbance may result in impacts on these resources. These impacts would be reduced through design features of the Proposed Action for environmental protection and agency-required mitigation measures aimed to limit introduction of noxious and invasive species, prevent water quality degradation, and avoid disturbance during sensitive periods. All alternative routes could affect federally listed Colorado River fish species through water depletions and alteration of downstream flow regimes but are expected to comply with the Upper Colorado River Recovery Program and minimize these impacts.

In Segment 2, both alternative routes would avoid impacts on fish and aquatic resources in the Big Sandy River using HDD. The Proposed Action would result in greater disturbance and potential impacts on aquatic conservation areas and aquatic crucial priority areas where it crosses the Big Sandy River and Little Sandy Creek. Where both alternative routes cross the Big Sandy River, impacts on the BLM sensitive flannelmouth sucker are expected to be avoided through use of HDD. However, the Proposed Action may result in impacts on the BLM sensitive bluehead sucker where the Proposed Action crosses Little Sandy Creek. Impacts resulting from both alternative routes would be reduced through design features of the Proposed Action for environmental protection and agency-required mitigation measures aimed to limit introduction of noxious and invasive species and prevent water quality degradation. Both alternative routes could affect federally listed Colorado River fish species through water depletions and alteration of downstream flow regimes but are expected to comply with the Upper Colorado River Recovery Program and minimize these impacts.

In Segment 3, none of the alternative routes are expected to result in impacts on fish or aquatic resources. All alternative routes could affect federally listed Platte River species through water depletions and alteration of downstream flow regimes but are expected to comply with the Platte River Recovery Implementation Program and minimize these impacts.

The MLV distribution lines and 230kV transmission line will not result in direct impacts on fish or aquatic resources. Regardless, these facilities will be subject to compliance for Colorado River and Platte River federally listed species.

4.3.4 Geology and Topography

4.3.4.1 Issues Identified for Analysis

4.3.4.1.1 Physiography and Geology (Including Geological Hazards)

Issues identified during internal coordination and agency and public scoping included:

- Potential impacts on the Project from geological hazards
- Potential impacts of the Project related to geological hazards

4.3.4.1.2 Mineral Resources

Issues identified during internal coordination and agency and public scoping included:

- Potential impacts on other oil and gas producers in Wyoming
  - Affect the production of other oil and gas producers in Wyoming production
  - Facilitate increased oil and gas production or exploration (and associated impacts)
- Potential impacts on mining activities and mining materials
- Potential impacts on leasable, salable, and locatable minerals and on mineral resources

Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.4.2 Types of Potential Effects

4.3.4.2.1 Physiography and Geology (Including Geological Hazards)

The Project would not be anticipated to affect faults or cause earthquakes. Only a small number of faults are crossed by the Project and they are all classified as Class B and mostly likely to be post-Quaternary in age. However, the Project potentially could contribute to the destabilizing slopes in steep areas or areas where landslides have been previously reported. Landslides and flooding could have impacts on the Project. Geological hazards could directly or indirectly affect the construction, operation, and maintenance of the Project. Potential direct effects from the Project include the direct loss of equipment or injury to personnel as a result of seismic activity, flooding, or landslides. Potential indirect effects on the operation of the Project could include loss of service or product for the pipelines.

4.3.4.2.2 Mineral Resources

Mineral resources can be exposed at the surface, lie just below the surface, or be located several hundred feet below the surface. Oil and gas fields and leases exist in several areas crossed by the Project. Active mines and mining operations also exist near the Project alternative routes. Where mining operations or mineral resources cannot be avoided, construction and maintenance of the Project could have the following direct effects on mineral resources:

- Loss of a mineral resource caused by construction activities
- Limitation of development and extraction of mineral resources from the presence of permanent facilities
- Prevention of future development and extraction of mineral resources resulting from the presence of permanent facilities
- Potential to use local sources of sand and gravel for construction purposes and bedding for pipelines

In addition, a positive effect could also occur on mineral resources due to implementation of the Project. The pipeline project will be used for EOR at Bell Creek Field. Also, the proposed pipeline is to be oversized in construction to permit additional CO_2 transport when additional sources are found. The transport of CO_2 could be beneficial to future EOR projects.

4.3.4.3 Criteria for Assessing Impacts

4.3.4.3.1 Physiography and Geology (Including Geological Hazards)

Criteria were developed to assess the level of potential impacts resulting from a geological hazard on the Project. Quaternary faults younger than 150 years were assigned a high level of impact because they are considered to have the most recent activity. Quaternary faults older than 150 years, but younger than

15,000 years, were assigned a moderate level of impact since they have not been active in recent times. Quaternary faults older than 15,000 years, or those faults believed to be pre-Quaternary (Class B), were given a low level of impact since they are considered inactive.

Landslide potential was based on slope. Areas within the Project with slopes of 30 percent or greater were assigned a high level of impact from potential landslides. Areas with slopes between 15 and 30 percent were assigned a moderate level of impact from potential landslides. Areas with slopes less than 15 percent were assigned a low level of impact from potential landslides.

The potential for flooding was based on the Flood Hazard Rank of the National Pipeline Risk Index, which is an ordinal scale of 1 to 100. Those areas in the 85th to 100th percentile are considered to have the highest potential for flooding. Those areas in the 70th to 84th percentile are considered to have a moderate potential for flooding. Those areas in the 0 to 69th percentile are considered to have a low potential for flooding.

Criteria were developed to assess the intensity of potential effects on geology and topography associated with implementation of the Project (Table 4-33). These criteria form the baseline for determining whether impacts on geology and topography resources would occur at a high, moderate, or low level.

Table 4-33
Criteria for Assessing Level of Impacts from Geologic Hazards

Level of Impacts	Description
High	▪ Areas with steep terrain (30 percent slope or greater) or high landslide susceptibility ▪ Areas with Quaternary faults younger than 150 years ▪ Areas with highest susceptibility for flooding
Moderate	▪ Areas with moderately steep terrain (15 to 30 percent slope) or moderate landslide susceptibility ▪ Areas with pre-Quaternary faults older than 150 years, but younger than 15,000 years ▪ Areas with moderate susceptibility for flooding
Low	▪ Areas without steep terrain (0 to 15 percent slope) having low landslide susceptibility ▪ Areas with lowest susceptibility for flooding ▪ Areas with Quaternary faults older than 15,000 years

4.3.4.3.2 Mineral Resources

Criteria were developed to assess the intensity of potential effects on mineral resources associated with implementation of the Project (Table 4-34). These criteria form the baseline for determining whether impacts on mineral resources would occur at a high, moderate, or low level, based on the type of mineral resource and any activities associated with the mineral resource.

Table 4-34
Criteria for Assessing Level of Impacts on Mineral and Energy Development

Level of Impacts	Description
High	▪ Areas with active mines or active mining claims ▪ Areas with producing oil and gas or geothermal wells
Moderate	▪ Permitted mines ▪ Coal leases ▪ Oil and gas leases ▪ Geothermal leases
Low	▪ Potential mineral areas[1]

NOTE: [1]Areas where a mineral resource potential is identified but is not currently being developed

4.3.4.4 Mitigation Planning

4.3.4.4.1 Physiography and Geology (Including Geological Hazards)

Residual impacts represent anticipated impacts on geology and topography resources that would remain after implementation of agency-required mitigation measures (refer to Table 4-2). The specific design features of the Proposed Action for environmental protection relevant to geological hazards include:

- **Design Feature 21 (mitigation measure development).** Applied to establish mitigation measures, as needed, based on the agreement of Denbury and the BLM, to address changing conditions or requirements within the Project area throughout the operational phase.
  - May potentially include preparation of a seismic report to identify the presence or absence of faults
  - May potentially include special designs to prevent future slumping

The level of potential residual impacts on geology and topography resources associated with implementation of the Project was assessed using the criteria presented in Table 4-33. The agency-required mitigation measures applied to avoid, reduce, or minimize impacts on geologic and topographic resources include:

- **Agency-Required Mitigation Measure 1 (sensitive resource avoidance).** Applied where the Project would cross previously identified geological hazards.
  - May include preparation of seismic report to identify the presence or absence of faults
- **Agency-Required Mitigation Measure 2 (minimize construction on greater slopes).** Applied in areas with steep slopes to prevent landslides.

Table 4-35 includes types of physiography and geology (including geologic hazards) affected from the implementation of the Project, including initial and residual impacts, and the agency-required mitigation measures to be used.

Table 4-35
Summary of Initial and Residual Impacts on Geologic Hazards

Resource	Initial Impact	Agency-Required Mitigation Measure	Residual Impact
Quaternary faults younger than 150 years	High	–	High
30 percent or greater slope/high landslide susceptibility	High	2	Low
Highest susceptibility for flooding (85 to 100)	High	1	Low
Quaternary faults older than 150 years, but less than 15,000 years	Moderate	–	Moderate
15 to 30 percent slopes/high landslide susceptibility	Moderate	2	Low
Moderate susceptibility for flooding (70 to 84)	Moderate	1	Low
Areas with 0 to 15 percent slope or low susceptibility for landslides	Low	–	Low
Areas with low or no susceptibility for flooding (0 to 69)	Low	–	Low
Quaternary faults older than 15,000 years	Low	–	Low

NOTE: Initial impacts reflect implementation of the design features of the Proposed Action for environmental protection, which are considered to be part of the Applicant's Project description (and include the Applicant-committed measures [Appendix A]). Residual impacts reflect the anticipated effects that would remain after implementation of agency-required mitigation measures.

4.3.4.4.2 Mineral Resources

Residual impacts represent anticipated effects on mineral resources that would remain after implementation of agency-required mitigation measures (refer to Table 4-2). The level of potential residual impacts on mineral resources associated with implementation of the Project was assessed using the criteria presented in Table 4-34. The agency-required mitigation measures applied to avoid, reduce, or minimize impacts on mineral resources include:

- **Agency-Required Mitigation Measure 1 (sensitive resource avoidance). A**pplied in areas where the Project could directly impact an active mine, mining claim, or producing well. The Applicant would acquire all access permissions for lands outside of their jurisdiction and resolve any conflicts regarding mineral claims ownership and compensation for economic impacts on leaseholders.

The Applicant must acquire all access permissions for lands outside of their jurisdiction. The BLM expects that the Applicant would resolve any conflicts regarding mineral ownership and access along the selected route, including any compensation for economic impacts on leaseholders or landowners. Also, it is the responsibility of the right-of-way grantee to conduct proper due diligence to ensure that legally valid mining claims are respected and agreements are made with claim owners. In general, the BLM expects that the likelihood and potential for such conflict are low and the effect small. In addition to the above process, Agency-Required Mitigation Measure 1 (sensitive resource avoidance) could be applied to reduce impact on mineral resources.

Table 4-36
Summary of Initial and Residual Impacts on Mineral Resources

Resource	Initial Impact	Agency-Required Mitigation Measure	Residual Impact
Areas with active mines and active mining claims	High	1	Low
Producing oil and gas or geothermal wells	High	1	Low
All leases	Moderate	0	Moderate
Potential mining resources	Low	0	Low

NOTE: Initial impacts reflect implementation of the design features of the Proposed Action for environmental protection, which are considered to be part of the Applicant's Project description (and include the Applicant-committed measures [Appendix A]). Residual impacts reflect the anticipated effects that would remain after implementation of agency-required mitigation measures.

4.3.4.5 Results (Direct and Indirect Residual Effects)

Inventory and residual impacts for this section are displayed on MV-2, MV-3, and MV-4.

4.3.4.5.1 Physiography and Geology (including Geological Hazards)

Table 4-37 shows the inventory and residual impacts (after mitigation) for the Proposed Action and alternative routes.

4.3.4.5.1.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment would remain as it presently exists.

Table 4-37
Geological Hazards Inventory Data and Residual Impacts

Alternative Route	Total Miles	Resource Inventory (miles)							Residual Impacts[1] (miles)	
		Flood (0 to 69 years)	Flood (70 to 84 years)	Flood (85 to 100 years)	Class B Fault[2]	Slope/Landslide (0 to 15 percent)	Slope/Landslide (15 to 30 percent)	Slope/Landslide (greater than 30 percent)	None	Low
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant										
1A: Proposed Action	30.4	16.4	7.6	6.4	0.0	28.8	1.5	0.1	0.0	30.4
1A Variation: Dry Basin Draw	30.7	16.7	7.6	6.4	0.0	29.5	1.1	0.1	0.0	30.7
1B: Dry Piney	34.5	21.7	6.9	5.9	0.0	32.8	1.6	0.1	0.0	34.5
1C: Figure Four	38.5	26.1	5.9	6.5	0.0	36.2	2.3	0.0	0.0	38.5
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect										
2A: Proposed Action	129.1	120.0	9.1	0.0	0.0	128.5	0.6	0.0	0.0	129.1
2B: Southern Route	136.2	115.8	14.3	6.1	0.0	135.6	0.6	0.0	0.0	136.2
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect										
3A: Proposed Action	83.2	74.6	8.6	0.0	0.3	79.8	3.2	0.2	0.0	83.2
3B: Lost Creek to Lost Cabin	73.0	61.7	10.7	0.6	0.3	72.2	0.8	0.0	0.0	73.0
3C: Lost Creek to Highway 20/26	101.4	80.5	20.3	0.6	0.3	100.5	0.9	0.0	0.0	101.4

SOURCE: OPS Hazard Index 1996
NOTES:
[1]With the implementation of agency-required mitigation measures identified for this resource, no high or moderate impacts would be anticipated.
[2]Age suspect or older than Quaternary

4.3.4.5.1.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction

Other than the injection wells discussed in the next subsection, the Riley Ridge Sweetening Plant would result in only surface disturbance and would not affect physiology and topography.

Injection Wells

The acid gas (H_2S) disposal injection wells (the Chapel Canyon 1-31 and 1-44) would be drilled at the Riley Ridge Sweetening Plant. The wells are scheduled to be drilled to a total depth of 20,000 feet and the formations proposed for injection are the Mississippian Madison Group and the Ordovician Big Horn Dolomite. The top of the Madison Group is estimated to occur at a depth of approximately 18,000 feet. To the top of the Madison Group, the wells will encounter Tertiary, Mesozoic, and Paleozoic sedimentary rocks comprised mainly of sandstones, shales, and limestones. The Madison Group ranges from 800 to 900 feet thick and generally consists of interbedded limestone, dolomite, calcareous shales, and thin beds of chert (Watson 1980; Stewart and Street 1992). The other proposed injection formation is the Big Horn Dolomite, which is expected to occur at an approximate depth of 19,250 feet. The Big Horn Dolomite is estimated to be from 400 to 450 feet thick and is composed of massive dolomite. The Devonian Darby Formation lies between the Madison Group and the Big Horn Dolomite and is composed of interbedded limestone, dolomite, shale, and siltstones. Refer to Resource Report 6 of the preliminary POD (Appendix A).

Segment 1 Pipeline Alternative Routes

Alternative 1A: Proposed Action would result in 6.4 miles of high impacts related to high potential for flooding and 7.6 miles of moderate effects related to moderate potential for flooding. Alternative 1A: Proposed Action would also cross 0.1 mile in areas with high susceptibility to landslides and 1.5 miles with moderate susceptibility to landslides. Construction activities in those areas with identified geological hazards could result in impacts on the Project and could activate landslide areas. The implementation of design features of the Proposed Action for environmental protection and agency-required mitigation measures would minimize the potential for these impacts from geological hazards, reducing all residual impacts to low.

The impacts of geological hazards on the Project for Alternative 1A Variation: Dry Basin Draw are similar to those for Alternative 1A: Proposed Action. In comparison to Alternative 1A: Proposed Action, Alternative 1B: Dry Piney has 0.5 fewer miles of areas with high potential for flooding and 0.7 fewer miles of areas with moderate potential for flooding. Alternative 1B: Dry Piney crosses 0.1 more miles of areas with moderate susceptibility to landslides. Alternative 1C: Figure Four crosses 0.1 more miles of areas with high susceptibility to flooding and 0.5 fewer miles with moderate susceptibility to flooding than Alternative 1A: Proposed Action. Alternative 1C: Figure Four would also cross 0.8 more miles of areas with moderate potential for landslides and 0.1 fewer miles of areas with high susceptibility to landslides.

4.3.4.5.1.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Alternative 2A: Proposed Action crosses 9.1 miles of areas having moderate potential for flooding and 0.6 mile of areas with moderate potential for landslides. Construction activities in those areas with identified geological hazards could result in impacts on the Project and activate landslide areas. The implementation of design features for the Proposed Action for environmental protection and agency-

required mitigation measures would minimize the potential for these impacts from geological hazards, reducing all residual impacts to low.

Alternative 2B: Southern Route crosses 6.1 more miles of areas with high susceptibility to flooding, and 5.2 more miles of areas with moderate susceptibility to flooding than Alternative 2A: Proposed Action. Alternative 2B: Southern Route would have similar impacts on areas with high and moderate susceptibility to flooding as Alternative 1A: Proposed Action.

4.3.4.5.1.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Alternative 3A: Proposed Action crosses 8.6 miles of areas with moderate potential for flooding, 0.2 mile of areas with high susceptibility to landslides, and 3.2 miles of areas having moderate susceptibility to landslides. Alternative 3A: Proposed Action also crosses 0.3 mile of Class B faults. Construction activities in those areas with identified geological hazards could result in impacts on the Project and could activate landslide areas. The implementation of design features of the Proposed Action for environmental protection and agency-required mitigation measures would minimize the potential for these impacts from geological hazards, reducing all residual impacts to low.

Alternative 3B: Lost Creek to Lost Cabin crosses 0.6 more miles of areas with high susceptibility to flooding and 2.1 more miles of areas with moderate susceptibility to flooding than Alternative 3A: Proposed Action. Alternative 3B: Lost Creek to Lost Cabin crosses 0.2 fewer miles of areas with high susceptibility to landslides and 2.4 fewer miles of areas with moderate susceptibility to landslides than Alternative 3A: Proposed Action. Alternative 3B: Lost Creek to Lost Cabin crosses the same faults as Alternative 3A: Proposed Action.

Alternative 3C: Lost Creek to Highway 20/26 crosses 0.6 more miles of areas with high susceptibility to flooding and 11.7 more miles of areas with moderate susceptibility to flooding than Alternative 3A: Proposed Action. Alternative 3C: Lost Creek to Highway 20/26 would also cross 0.2 fewer miles of areas with high susceptibility to landslides and 2.3 fewer miles of areas with moderate susceptibility to landslides than Alternative 3A: Proposed Action. Alternative 3C: Lost Creek to Highway 20/26 crosses the same faults as the Proposed Action.

4.3.4.5.1.5 230-Kilovolt Transmission Line

The 230kV transmission line crosses areas with low potential for flooding and a low risk of landslides. No impacts would be anticipated.

4.3.4.5.1.6 Mainline Valve Distribution Lines

The construction of the MLV distribution lines could have impacts on or as a result of geological hazards. Without knowing the location of these distribution lines, the amount of impact resulting from construction of these distribution lines cannot be provided at this time. The poles for these lines are proposed to be approximately 250 feet apart and have a 20-foot by 20-foot temporary area of disturbance. It is estimated that there will be 1.1 miles of 12-foot-wide access roads for every 1.0 mile of distribution lines. These access roads would be reclaimed.

The construction of above-ground poles would have less impact on or from geological hazards than the alternative buried lines. The design features of the Proposed Action for environmental protection and agency-required mitigation measures to reduce impacts associated with construction of the Proposed Action, on geological hazards, would be followed for the distribution lines.

4.3.4.5.2 Mineral Resources

Table 4-38 shows the inventory and residual impacts (after mitigation) for the Proposed Action and alternative routes.

Table 4-38
Mineral Resources Inventory Data and Residual Impacts

Alternative Route	Total Miles	Inventory (miles crossed)				Residual Impacts (miles)[1]		
		Active Mine or Active Mining Claims	All Leases	Producing Oil and Gas or Geothermal Wells	Potential Mineral Resources	None	Low	Moderate
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant								
1A: Proposed Action	30.4	0.0	25.6	1.0	8.0	2.3	2.5	25.6
1A Variation: Dry Basin Draw	30.7	0.0	26.9	0.7	7.2	2.2	1.6	26.9
1B: Dry Piney	34.5	0.0	28.7	0.6	11.5	4.0	1.8	28.7
1C: Figure Four	38.5	0.0	36.8	3.4	22.3	0.4	1.3	36.8
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect								
2A: Proposed Action	129.1	0.0	64.8	0.0	24.7	58.4	5.9	64.8
2B: Southern Route	136.2	0.0	72.9	0.3	55.3	37.5	25.8	72.9
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect								
3A: Proposed Action	83.2	0.0	43.2	0.3	30.0	31.3	8.7	43.2
3B: Lost Creek to Lost Cabin	73.0	0.0	60.7	1.3	26.8	8.3	4.0	60.7
3C: Lost Creek to Highway 20/26	101.4	0.0	69.3	1.0	27.8	26.3	5.8	69.3

SOURCES: BLM 1987, 2008b, 2015b; WSGS 2005; SWCA 2014d; USGS 2014, 2015a
NOTE: [1]With the implementation of agency-required mitigation measures identified for this resource, no high impacts would be anticipated.

4.3.4.5.2.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.4.5.2.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction and Injection Wells

The Riley Ridge Sweetening Plant and injection wells would result in only surface disturbance and would not affect mineral resources.

Segment 1 Pipeline Alternative Routes

For mineral resources, there is some overlap resulting in mileage of impacts greater than the total mileage for an alternative route. For example, an active mine or producing well could be within a lease. Construction activities in those areas with identified mineral resources could result in impacts on those mineral resources. Resolving any land-use conflicts, as described above, and applying Agency-Required

Mitigation Measure 2, when possible, results in 25.6 miles of moderate residual impacts, 2.5 miles of low residual impacts, and 2.3 miles of no residual impacts on mineral resources along Alternative 1A: Proposed Action.

Alternative 1A Variation: Dry Basin Draw crosses 1.3 more miles of leases, 0.3 fewer miles of producing oil and gas or geothermal wells, and 0.6 fewer miles of potential mineral resources than the Proposed Action. Construction activities in those areas with identified mineral resources could result in impacts on those mineral resources. Resolving any land-use conflicts, as described above, and applying Agency-Required Mitigation Measure 2, when possible, results in 26.9 miles of moderate residual impacts, 1.6 miles of low residual impacts, and 2.2 miles of no residual impacts along Alternative 1A Variation: Dry Basin Draw.

Alternative 1B: Dry Piney crosses 3.1 more miles of leases, 0.4 fewer miles of producing oil and gas or geothermal wells, and 3.5 more miles of potential mineral resources than Alternative 1A: Proposed Action. Construction activities in those areas with identified mineral resources could result in impacts on those mineral resources. Resolving any land-use conflicts, as described above, and applying Agency-Required Mitigation Measure 2, when possible, results in 28.7 miles of moderate residual impacts, 1.8 miles of low residual impacts, and 4.0 miles of no residual impacts along Alternative 1B: Dry Piney.

Alternative 1C: Figure Four crosses 11.2 more miles of leases, 2.4 more miles of producing oil and gas or geothermal wells, and 14.7 more miles of potential mineral resources than Alternative 1A: Proposed Action. Construction activities in those areas with identified mineral resources could result in impacts on those mineral resources. Resolving any land-use conflicts, as described above, and applying Agency-Required Mitigation Measure 2, when possible, results in 36.8 miles of moderate residual impacts, 1.3 miles of low residual impacts, and 0.4 mile of no residual impacts along Alternative 1C: Figure Four.

4.3.4.5.2.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Alternative 2A: Proposed Action crosses 64.8 miles of leases and 24.7 miles of potential mineral resources. Construction activities in those areas with identified mineral resources could result in impacts on those mineral resources. Resolving any land-use conflicts, as described above, and applying Agency-Required Mitigation Measure 2, when possible, results in 64.8 miles of moderate residual impacts, 5.9 miles of low residual impacts, and 58.4 miles of no residual impacts along Alternative 2A: Proposed Action.

Alternative 2B: Southern Route crosses 8.1 more miles of leases and 30.6 more miles of potential mineral resources. In addition, Alternative 2B: Southern Route crosses 0.3 mile of producing oil and gas or geothermal wells. Construction activities in those areas with identified mineral resources could result in impacts on those mineral resources. Resolving any land-use conflicts, as described above, and applying Agency-Required Mitigation Measure 2, when possible, results in 72.9 miles of moderate residual impacts, 25.8 miles of low residual impacts, and 37.5 miles of no residual impacts along Alternative 2B: Southern Route.

4.3.4.5.2.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Alternative 3A: Proposed Action crosses 43.2 miles of leases, 0.3 mile of producing oil and gas or geothermal wells, and 30.0 miles of potential mineral resources. Construction activities in those areas with identified mineral resources could result in impacts on those mineral resources. Resolving any land-use conflicts, as described above, and applying Agency-Required Mitigation Measure 2, when possible,

results in 43.2 miles of moderate residual impacts, 8.7 miles of low residual impacts, and 31.3 miles of no residual impacts along Alternative 3A: Proposed Action.

Alternative 3B: Lost Creek to Lost Cabin crosses 17.5 more miles of leases, 1.0 more mile of producing oil and gas or geothermal wells, and 3.2 fewer miles of potential mineral resources than Alternative 3A: Proposed Action. Construction activities in those areas with identified mineral resources could result in impacts on those mineral resources. Resolving any land-use conflicts, as described above, and applying Agency-Required Mitigation Measure 2, when possible, results in 60.7 miles of moderate residual impacts, 4.0 miles of low residual impacts, and 8.3 miles of no residual impacts along Alternative 3B: Lost Creek to Lost Cabin.

Alternative 3C: Lost Creek to Highway 20/26 crosses 26.1 more miles of leases, 0.7 fewer miles of producing oil and gas or geothermal wells, and 2.2 fewer miles than Alternative 3A: Proposed Action. Construction activities in those areas with identified mineral resources could result in impacts on those mineral resources. Resolving any land-use conflicts, as described above, and applying Agency-Required Mitigation Measure 2, when possible, results in 69.3 miles of moderate residual impacts, 5.8 miles of low residual impacts, and 26.3 miles of no residual impacts along Alternative 3C: Lost Creek to Highway 20/26.

4.3.4.5.2.5 230-Kilovolt Transmission Line

The 230kV transmission line crosses an oil and gas lease, but no active mines or producing wells are within the right-of-way. It is expected the Applicant would resolve any conflicts regarding mineral ownership and access along the transmission line route, including any compensation for economic impacts on leaseholders. In general, the likelihood and potential for such conflict are low and the effects limited. With the availability of current technology, mining and oil and gas recovery still could occur in proximity to the transmission line.

4.3.4.5.2.6 Mainline Valve Distribution Lines

The MLV distribution lines are expected to result in temporary and permanent disturbance to mineral resources. Without knowing the location of these distribution lines, the amount of impact resulting from construction of these distribution lines cannot be provided at this time. The poles for these lines are proposed to be approximately 250 feet apart and have a 20-foot by 20-foot temporary area of disturbance. It is estimated that there will be 1.1 miles of 12-foot-wide access road for every 1.0 mile of distribution lines. These access roads would be reclaimed.

The construction of above-ground poles versus buried lines could have different impacts on mineral resources. Above-ground poles and lines could restrict extraction of a mineral resource due to the overhead lines, whereas a buried line could directly affect a greater area of a mineral resource. The design features and agency-required mitigation measures to reduce impacts associated with construction of the Proposed Action on mineral resources would be followed for the distribution lines.

4.3.4.6 Summary Comparison of Alternative Routes

For Segment 1, the Proposed Action and the alternative routes have similar impacts on, and possibly from, geologic hazards. For Segment 2, Alternative 2B: Southern Route has a higher possible impact from flooding. For Segment 3, the impacts are similar, but Alternative 3C: Lost Creek to Highway 20/26 has a greater risk of impact from flooding and Alternative 3A: Proposed Action has a greater risk from landslides. Through application of design features and agency-required mitigation measures, these impacts would be minimized to the extent practicable.

For impacts on mineral resources for Segment 1, Alternative 1C: Figure Four would have the greatest impacts on leases, producing wells, and potential mineral resources. For Segment 2, Alternative 2A: Proposed Action and Alternative 2B: Southern Route are similar except Alternative 2B: Southern Route has a higher impact on potential mineral resources. For Segment 3, impacts on mineral resources are similar, but Alternative 3C: Lost Creek to Highway 20/26 does have a higher potential impact on leases, and Alternative 3B: Lost Creek to Lost Cabin would have a higher impact on producing wells. Through application of design features and agency-required mitigation measures, these impacts would be minimized to the extent practicable.

4.3.5 Lands and Realty

4.3.5.1 Issues Identified for Analysis

Lands and realty issues were identified during the Project's public scoping period and internal agency scoping. The issues and information related to potential impacts on land-use and realty resources are included below and were used to guide the focus and level of detail of the NEPA analysis.

- Potential conflicts with existing land uses, land-management objectives (e.g., agricultural, conservation, residential, etc.), authorized land uses, and realty authorizations
- Potential conflicts with future land uses (e.g., planned development) and future realty authorizations (e.g., rights-of-way, land tenure adjustments, withdrawals, etc.)
- Potential conflicts with permitted oil and gas development
- Routing of the Project on private lands (versus lands administered by the BLM)

Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.5.2 Types of Potential Effects

Construction of the Project would have direct effects on land-use resources and realty authorizations. Direct effects include:

- Activities that disrupt existing land uses and realty authorizations from ground-clearing and construction activities
- Interference with maintenance and access of existing utility infrastructure from construction of the Project (i.e., transmission lines, oil and gas pipelines, etc.)
- Interference with construction and access of new utility infrastructure from construction of the Project (i.e., transmission lines, oil and gas pipelines, etc.)
- Permanent disturbance to existing land-use types from Project above-ground facilities or access roads
- Conflicts with authorized and future land-use projects from:
    - Establishment of above-ground facilities or access roads
    - Alternation of the availability of previous land-use types or the need to make necessary special conditions, stipulations, or acreage reductions

4.3.5.3 Criteria for Assessing Impacts

Criteria were developed to assess the intensity of potential effects on land-use resources and realty authorizations associated with implementation of the Project (Table 4-39). These criteria form the baseline for determining the level of impacts on existing, authorized, and future land-use resources.

Table 4-39 Criteria for Assessing Level of Impacts on Existing and Future Land Uses and Authorized Projects	
Level of Impacts	**Description**
High	▪ Areas where the Project would conflict physically and/or create a direct long-term conflict with existing land uses, such as residential, commercial, rangeland or agricultural uses ▪ Areas where the Project would conflict physically and create a direct, long-term conflict with industrial uses (e.g., loss of or change to existing land use)
Moderate	▪ Areas where the Project would create a direct (short-term) and/or indirect (short- or long-term) conflict with existing land uses, such as residential or commercial use (e.g., noise or limiting access) ▪ Areas where the Project would create a direct long-term conflict with authorized residential, commercial, rangeland, agricultural, or industrial projects (e.g., inability to develop an authorized subdivision or an authorized oil and gas lease) or pending realty authorizations (e.g., approved rights-of-way, land tenure adjustments, withdrawals, etc.) ▪ Areas where the Project would create a direct long-term conflict with planned residential, commercial, rangeland, agricultural, or industrial projects (e.g., limiting or preventing future mineral developments or subdivisions), including the design, construction, and operation of these project facilities
Low	▪ Areas where the Project would create a direct (short-term) and/or indirect (short- or long-term) conflict with existing land uses, such as rangeland, agricultural, or industrial use and/or management (e.g., spread of noxious weeds on grazing or agricultural land, interference with livestock operations, mortality of livestock from increased traffic, or limiting access to mineral developments) ▪ Areas where the Project would be compatible with authorized land uses, such as industrial areas (e.g., avoidance of authorized mineral development) or future realty authorizations (e.g., planned rights-of-way, land tenure adjustments, withdrawals, etc.) ▪ Areas where the Project would be compatible with planned land uses, such as industrial areas (e.g., avoidance of future mineral development)

4.3.5.4 Mitigation Planning

Initial impacts are those impacts resulting from the implementation of the Project, including implementation of design features of the Proposed Action for environmental protection (Table 2-18). Initial impacts were assigned using the criteria presented in Table 4-39. The specific design features of the Proposed Action for environmental protection that are relevant to lands and realty include:

- **Design Feature 22 (lands and realty). A**pplied to avoid impacts on existing utility infrastructure and to protect and preserve existing survey monuments and markers during the construction and operational phases of the Project.

Residual impacts represent anticipated effects on lands and realty that would remain after implementation of agency-required mitigation measures (refer to Table 4-2). The level of potential residual impacts on lands and realty resources associated with implementation of the Project was assessed using the criteria presented in Table 4-39. The agency-required mitigation measures applied to avoid, reduce, or minimize impacts on lands and realty resources include:

- **Agency-Required Mitigation Measure 1 (sensitive resource avoidance).** Applied where the Project could directly affect existing, authorized, or future land uses. This would include existing utilities and authorized and future rights-of way, as well as RFFAs. Avoidance of these resources can be achieved by reducing the width of the right-of-way or micro-siting to avoid impacts on land-use resources.

- **Agency-Required Mitigation Measure 3 (minimizing or avoiding disturbance to sensitive soils and vegetation).** Applied where the Project could directly affect existing, authorized, or future land uses specifically in areas where soils and vegetation are particularly sensitive to disturbance or where existing roads/two-tracks to be used for construction and maintenance would not be widened or otherwise upgraded to the extent practicable.
- **Agency-Required Mitigation Measure 5 (overland access).** Applied where the Project could directly impact existing, authorized, or future land uses. This measure would be applied during the construction phase.
- **Agency-Required Mitigation Measure 9 (minimize new or improved accessibility).** Applied where the Project could directly affect existing, authorized, or pending road rights-of-way.

Table 4-40 includes types of land-use resources affected by the implementation of the Project, the initial and residual impacts, and the agency-required mitigation measures to be used.

Table 4-40
Summary of Initial and Residual Impacts on Lands and Realty

Resource	Initial Impact	Agency-Required Mitigation Measure	Residual Impact
Existing Land Use			
Utilities			
Transmission Lines	Low	1	Low
Pipelines	Low	1	Low
Communication Facilities (Met Tower)	Low	1	Low
Compressor Pump Stations	Low	1	Low
GAP Data			
Barren Ground	Low	–	Low
Developed	High	1, 3, 5	Moderate
Grassland	Low	–	Low
Shrubland	Low	–	Low
Wetland/Riparian/Open water	Low	1	Low
Authorized Projects			
Rights-of-Way: Authorized	Moderate	1,3,9	Low
Future Land Use			
Rights-of-Way: Pending	Moderate	1,3,9	Low
Other RFFAs	Low	1	Low

NOTE: Initial impacts reflect implementation of the design features of the Proposed Action for environmental protection, which are considered to be part of the Applicant's Project description (and include the Applicant-committed measures [Appendix A]). Residual impacts reflect the anticipated effects that would remain after implementation of agency-required mitigation measures.

4.3.5.5 Results (Direct and Indirect Residual Effects)

Inventory and impact results for this section are displayed on MV-5. Table 4-41 through Table 4-46 also present the inventory and impact results for this section.

4.3.5.5.1 Land Jurisdiction, Utility Corridors, and Parallel Facilities

Table 4-41 includes miles of land jurisdiction crossed by the Project by segment for all alternative routes.

Table 4-41 Land Jurisdiction				
Alternative Route	**Total Length of Alternative Route (Miles)**	**Jurisdiction (Miles Crossed)**		
		Bureau of Land Management	**Private**	**State**
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant				
1A: Proposed Action	30.4	25.2	2.5	2.7
1A Variation: Dry Basin Draw	30.7	25.5	2.5	2.7
1B: Dry Piney	34.5	23.9	7.5	3.4
1C: Figure Four	38.5	31.9	3.1	3.5
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect				
2A: Proposed Action	129.1	121.5	0.5	7.1
2B: Southern Route	136.2	123.8	9.7	2.7
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect				
3A: Proposed Action	83.2	40.3	36.2	6.7
3B: Lost Creek to Lost Cabin	73.0	51.0	17.6	4.4
3C: Lost Creek to Highway 20/26	101.4	50.1	42.6	8.7
SOURCE: Surface Ownership (BLM 2008c)				

Table 4-42 includes a summary of BLM-designated utility corridors for the Project by segment for all alternative routes.

Table 4-42 Summary of Bureau of Land Management Designated Utility Corridors and West-Wide Energy Corridors by Alternative Route				
Alternative Route	**Total Miles**	**Bureau of Land Management Designated Utility Corridor and Wide-Wide Energy Corridor Name**	**Bureau of Land Management Field Office**	**Miles Crossed**
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant				
1A: Proposed Action	30.4	None present	Not applicable	Not applicable
1A Variation: Dry Basin Draw	30.7	None present	Not applicable	Not applicable
1B: Dry Piney	34.5	None present	Not applicable	Not applicable
1C: Figure 4	38.5	None present	Not applicable	Not applicable
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect				
2A: Proposed Action	129.1	Bairoil	Lander	1.0
		Frontier	Lander	20.6
		Lost Creek	Lander	0.6
2B: Southern Route	136.2	Bairoil	Lander	1.0
		Frontier	Lander	20.6
		Lost Creek	Lander	0.6
		WWEC: 121-221	Rock Springs	8.8
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect				
3A: Proposed Action	83.2	Bairoil	Lander	1.7
		D6067 6068	Casper	5.2
		D6068	Casper	9.3
		D6068 Cabin Creek Corridor	Casper	9.3
		Lost Creek	Lander	36.4
		Sand Draw to Casper	Lander	9.3
3B: Lost Creek to Lost Cabin	73.0	Bairoil	Lander	1.7
		Lost Creek	Lander	71.0
		PacifiCorp East to West	Lander	0.5
		Sand Draw	Lander	0.5

Table 4-42 Summary of Bureau of Land Management Designated Utility Corridors and West-Wide Energy Corridors by Alternative Route				
Alternative Route	**Total Miles**	**Bureau of Land Management Designated Utility Corridor and Wide-Wide Energy Corridor Name**	**Bureau of Land Management Field Office**	**Miles Crossed**
3C: Lost Creek to Highway 20/26	101.4	Bairoil	Lander	1.7
		D6067 6068	Casper	30.0
		D6069 W Wide Energy	Casper	1.5
		Highway 20/26	Lander	10.0
		Lost Creek	Lander	59.7
		PacifiCorp East to West	Lander	0.5
		Sand Draw	Lander	0.5

Table 4-43 includes parallel facilities for the Project by segment for all alternative routes.

Table 4-43 Summary of Utilities and Parallel Facilities by Alternative Route									
Alternative Route	**Total Miles**	**Parallel Linear Facilities (within 250-feet of centerline) (miles)**				**Total Miles Parallel Linear Facilities (within 250 feet)**	**Transmission Line Facility Crossings**	**Pipeline Facility Crossings**	**Linear Facility Crossings (total)**
		115-kilovolt	**230-kilovolt**	**Unknown Voltage**	**Pipeline**				
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant									
1A: Proposed Action	30.4	–	–	–	1.9	1.9	0	9	9
1A Variation: Dry Basin Draw	30.7	–	–	–	3.0	3.0	0	13	13
1B: Dry Piney	34.5	–	–	–	9.4	9.4	0	17	17
1C: Figure 4	38.5	–	–	–	15.5	15.5	0	43	43
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect									
2A: Proposed Action	129.1	–	1.3	–	45.0	45.1	4	65	69
2B: Southern Route	136.2	–	1.3	–	69.2	69.4	4	93	97
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect									
3A: Proposed Action	83.2	0.3	0.6	0.3	49.6	50.1	8	70	78
3B: Lost Creek to Lost Cabin	73.0	0.2	0.3	–	54.6	54.6	3	58	61
3C: Lost Creek to Highway 20/26	101.4	0.2	0.3	0.2	51.4	51.8	4	62	66

4.3.5.5.1.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.5.5.1.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction

The Riley Ridge Sweetening Plant is located on land determined by the BLM in previous planning to be available for leasing. Therefore, no additional impacts on land use would result from the construction or operation of the facility.

Injection Wells

Potential impacts on land use would be the same as those discussed for the Riley Ridge Sweetening Plant.

Segment 1 Pipeline Alternative Routes

Land Jurisdiction

Refer to Table 4-41 for detailed information related to jurisdictional land crossed in Segment 1. Alternative 1A: Proposed Action and Alternative 1A Variation: Dry Basin Draw cross the least amount of private lands.

Bureau of Land Management Designated Utility Corridors

Refer to Table 4-42 and Map 4-1 for detailed information related to BLM-designated utility corridors crossed in Segment 1.

Parallel Facilities

Refer to Table 4-43 and Map 4-1, for detailed information related to parallel facilities crossed in Segment 1.

4.3.5.5.1.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Land Jurisdiction

Refer to Table 4-41 for detailed information related to jurisdictional land crossed in Segment 2. Alternative 2A: Proposed Action crosses the least amount of private lands.

Bureau of Land Management Designated Utility Corridors

Refer to Table 4-42 and Map 4-1 for detailed information related to BLM-designated utility corridors crossed in Segment 2.

Parallel Facilities

Refer to Table 4-43 and Map 4-1 for detailed information related to parallel facilities crossed in Segment 2.

4.3.5.5.1.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Land Jurisdiction

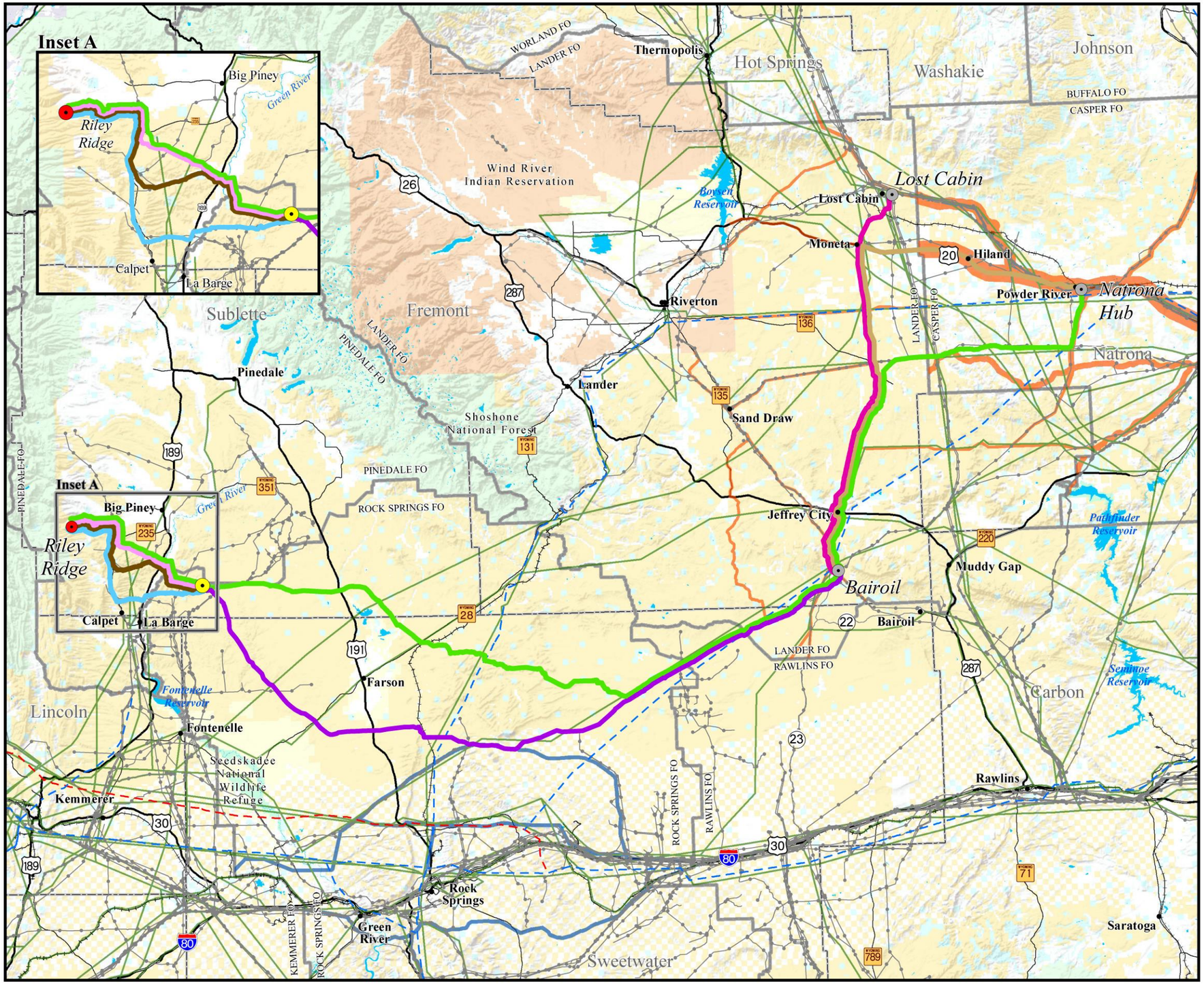
Refer to Table 4-41 for detailed information related to land jurisdiction crossed in Segment 3. Alternative 3B: Lost Creek to Lost Cabin crosses the least amount of private lands.

Bureau of Land Management Designated Utility Corridors

Refer to Table 4-42 and Map 4-1 for detailed information related to BLM-designated utility corridors crossed in Segment 3.

Parallel Facilities

Refer to Table 4-43 and Map 4-1 for detailed information related to parallel facilities crossed in Segment 3.



Map 4-1
Linear Facilities and Utility Corridors

RILEY RIDGE TO NATRONA PROJECT

Linear Facilities
- 345kV Transmission Line
- 230kV Transmission Line
- Pipeline

Utility Corridors
- Designated Utility Corridors
- Western Utility Corridors
- West-wide Energy Corridors (WWEC)

Alternative Routes[1]

Segment 1
- 1A: Proposed Action
- 1A - Variation: Dry Basin Draw
- 1B: Dry Piney
- 1C: Figure 4

Segment 2
- 2A: Proposed Action
- 2B: Southern Route

Segment 3
- 3A: Proposed Action
- 3B: Lost Creek to Lost Cabin
- 3C: Lost Creek to Highway 20/26

Project Features
- Riley Ridge Treatment Plant
- Interconnect
- Proposed Riley Ridge Sweetening Plant

Land Ownership
- Bureau of Land Management
- Bureau of Reclamation
- Indian Reservation
- U.S. Department of Defense
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- State Land
- Private Land

General Reference
- City or Town
- Railroad
- Interstate Highway
- U.S. Highway
- State Highway
- Other Road
- Lake or Reservoir
- County Boundary
- BLM Field Office Boundary

SOURCES:
Transmission Lines, BLM 2004, 2010; Pipelines, BLM 2011, 2012;
Designated Utility Corridors, BLM 2002, 2004, 2008, 2011, 2014, 2015;
Western Utility Corridors, BLM 2004; West-wide Energy Corridors, BLM 2015;
Land Jurisdiction, BLM 2013; City or Town, ESRI 2013;
BLM Field Office Boundary, BLM 2008; Highways, Roads, and Railroads, ESRI 2013;
Water Features, ESRI 2008, USGS 2010; State and County Boundaries, ESRI 2013

NOTES:
[1]Preliminary route options are graphically depicted on map and, in some cases, share centerline alignment in common areas.

Last Revised: February 19, 2015
Draft EIS: March 2018

0 5 10 20
Miles

THIS PAGE INTENTIONALLY LEFT BLANK

4.3.5.5.1.5 230-Kilovolt Transmission Line

The proposed alignment for the 230kV line does not parallel or cross any linear facilities and is not located within any utility corridors. There would be no identifiable impacts associated with linear facilities or utility corridors from the proposed 230kV line.

4.3.5.5.2 Existing, Authorized, and Future Land Use

Impacts on existing, authorized, and future land-use resources by route and segment are listed in Table 4-44 and discussed below.

4.3.5.5.2.1 No Action Alternative

Under the No Action Alternative, a right-of-way grant on BLM-administered lands would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.5.5.2.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant

The Riley Ridge Sweetening Plant is located on land leased by the Applicant. Therefore, no impacts on existing, authorized, or future land use would result from the construction or operation of this facility.

Injection Wells

Potential impacts on existing, authorized, or future land use would be the same as those discussed for the Riley Ridge Sweetening Plant.

Segment 1 Pipeline Alternative Routes

Existing Land Use

Overall residual impacts, direct and indirect, to general land-use types for Alternative 1A: Proposed Action and all other alternative routes in Segment 1 are anticipated to be low, except for developed and disturbed lands, which are anticipated to be moderate due to permanent Project infrastructure. Alternative 1A: Proposed Action and all alternative routes cross all general developed land-use types listed in Table 4-44, except for limber pine-juniper. Mileage crossed would vary due to length of the alternative route, with Alternative 1C: Figure Four having the most mileage crossed and Alternative 1A: Proposed Action having the least. Refer to Table 4-44 for detailed information related to miles crossed.

Impacts associated with crossing these land-use types include temporary and permanent disturbance to the land type, interference with existing utility infrastructure, and interference or potential conflict with future land-use projects. Agency-Required Mitigation Measures 1, 3, and 5 would be applied where necessary to mitigate impacts on general land-use types.

Existing utility infrastructure crossed or paralleled in Segment 1 by the Proposed Action and alternative routes includes oil and gas pipelines and wells. Alternative 1A: Proposed Action crosses the congested B Unit Well area in Segment 1. Impacts associated with crossing this area include interference (e.g., limiting access) with maintenance and operation of these wells during construction of the Project. It is anticipated that long-term impacts would be low and that the Applicant would coordinate with the existing lease owners in this area to avoid major conflicts. Agency-Required Mitigation Measure 1 (sensitive resource avoidance) would be applied to avoid impacts on existing oil and gas pipeline infrastructure.

Table 4-44
Existing Land Use Inventory Data and Residual Impacts

Alternative Route	Total Miles	Resource Inventory (miles)											Residual Impacts (miles)[1]		
		Compressor Pump Station	Pipelines	Transmission Lines	Barren/Sparsely Vegetated[2]	Big Sagebrush	Developed/ Disturbed	Grassland	Limber Pine-Juniper	Riparian	Shrub/Shrub Steppe	Wetland	None	Low	Moderate
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant															
1A: Proposed Action	30.4	0.0	2.5	0.0	0.2	19.3	0.5	0.6	0.0	0.4	9.0	0.4	18.7	11.2	0.5
1A Variation: Dry Basin Draw	33.4	0.0	3.5	0.0	0.2	19.5	0.5	1.0	0.0	0.4	8.7	0.4	18.9	11.3	0.5
1B: Dry Piney	34.5	0.0	10.5	0.0	0.3	19.0	1.4	0.4	0.0	0.6	12.1	0.7	15.2	17.9	1.4
1C: Figure Four	38.5	0.0	19.2	0.0	0.3	16.6	1.9	0.4	0.0	0.7	18.3	0.3	11.6	25.0	1.9
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect															
2A: Proposed Action	129.1	0.0	47.8	1.9	3.4	60.1	0.2	0.3	0.0	1.2	63.8	0.1	49.7	79.2	0.2
2B: Southern Route	136.2	0.0	73.0	1.9	17.3	59.0	0.2	0.0	0.0	2.3	57.4	0.0	48.4	87.6	0.2
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect															
3A: Proposed Action	83.2	0.0	60.4	1.9	2.4	59.5	2.7	0.0	0.9	0.8	15.6	1.3	13.8	66.7	2.7
3B: Lost Creek to Lost Cabin	73.0	0.2	61.8	0.9	4.8	48.8	2.2	0.0	0.0	0.5	15.9	0.8	7.2	63.6	2.2
3C: Lost Creek to Highway 20/26	101.4	0.2	59.3	1.3	4.6	44.4	41.6	0.0	0.0	0.4	9.3	1.1	6.0	53.8	41.6

SOURCE: GAP Data (USGS 2015b)
NOTES:
[1]With the implementation of agency-required mitigation measures identified for this resource, no high impacts would be anticipated.
[2]Barren/Sparsely Vegetated is less than 10 percent cover.

Authorized Projects

Overall residual impacts on BLM-authorized projects from Alternative 1A: Proposed Action and the other alternative routes in Segment 1 are anticipated to be low. Miles of authorized projects crossed in Segment 1 are included in Table 4-45. Impacts associated with crossing authorized Project areas include interference (e.g., limiting access) with maintenance and operation of authorized projects. Agency-Required Mitigation Measures 1, 3, and 9 would be applied where necessary to mitigate impacts on authorized projects in Segment 1.

Table 4-45
Authorized Land Use Inventory Data and Residual Impacts

Alternative Route	Total Miles	Authorized Projects (miles)	Residual Impacts (miles)[1]	
			None	Low
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant				
1A: Proposed Action	30.4	20.4	10.0	20.4
1A Variation: Dry Basin Draw	33.4	20.7	10.0	20.7
1B: Dry Piney	34.5	25.3	9.2	25.3
1C: Figure Four	38.5	31.9	6.6	31.9
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect				
2A: Proposed Action	129.1	90.3	38.8	90.3
2B: Southern Route	136.2	74.5	61.7	74.5
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect				
3A: Proposed Action	83.2	60.0	23.2	60.0
3B: Lost Creek to Lost Cabin	73.0	53.6	19.4	53.6
3C: Lost Creek to Highway 20/26	101.4	68.5	32.9	68.5

SOURCE: BLM 2015b
NOTE: [1]With the implementation of agency-required mitigation measures identified for this resource, no high or moderate impacts would be anticipated.

Future Land Use

Overall residual impacts on future land-use resources for Alternative 1A: Proposed Action and all alternative routes in Segment 1 are anticipated to be low. Miles of future land-use projects crossed by the Proposed Action and alternative routes in Segment 1 are listed in Table 4-46. Impacts associated with crossing areas designated for future land-use projects include interference (e.g., limiting access) with potential future uses. It is anticipated that long-term effects would be low and that the Applicant would coordinate with lease owners in these areas to avoid major conflicts. Agency-Required Mitigation Measures 1, 3, and 9 would be applied where necessary to mitigate impacts on future land uses in Segment 1.

Table 4-46
Future Land Use Inventory Data and Residual Impacts

Alternative Route	Total Miles	Resource Inventory (miles)		Residual Impacts (miles)[1]	
		BLM LR2000	Reasonably Foreseeable Future Actions	None	Low
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	30.4	0.0	20.8	9.6	20.8
1A Variation: Dry Basin Draw	33.4	0.0	21.1	9.6	21.1
1B: Dry Piney	34.5	0.0	24.9	9.6	24.9
1C: Figure Four	38.5	0.0	30.7	7.8	30.7

Table 4-46 Future Land Use Inventory Data and Residual Impacts					
Alternative Route	**Total Miles**	**Resource Inventory (miles)**		**Residual Impacts (miles)[1]**	
		BLM LR2000	**Reasonably Foreseeable Future Actions**	**None**	**Low**
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	129.1	3.8	13.4	112.5	16.6
2B: Southern Route	136.2	3.0	0.0	133.2	3.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	83.2	1.2	0.0	82.0	1.2
3B: Lost Creek to Lost Cabin	73.0	4.1	14.5	57.3	15.7
3C: Lost Creek to Highway 20/26	101.4	2.4	20.2	78.8	22.6

SOURCE: BLM 2015b
NOTE: [1]With the implementation of agency-required mitigation measures identified for this resource, no high or moderate impacts would be anticipated.

4.3.5.5.2.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Existing Land Use

Impacts on general land-use types for Alternative 2A: Proposed Action and all alternative routes in Segment 2 are anticipated to be similar to those alternative routes described in Segment 1. In Segment 2, Alternative 2A: Proposed Action and alternative routes cross all general developed land-use types listed in Table 4-44, except for limber pine-juniper and grasslands. Agency-Required Mitigation Measures 1, 3, and 5 would be applied where necessary to mitigate impacts on general land-use types. Existing oil and gas pipelines and transmission lines are crossed or paralleled in Segment 2 by the Proposed Action and alternative routes. Impacts associated with crossing existing utility structures by Alternative 2A: Proposed Action and Alternative 2B: Southern Route are anticipated to be similar to impacts on alternative routes described in Segment 1. Agency-Required Mitigation Measure 1 (sensitive resource avoidance) would be applied to avoid impacts on oil and gas pipeline infrastructure.

Authorized Projects

Overall residual impacts on BLM-authorized projects for Alternative 2A: Proposed Action and Alternative 2B: Southern Route are anticipated to be similar to impacts on alternative routes described in Segment 1. Miles of authorized projects crossed in Segment 2 are included in Table 4-45. Agency-Required Mitigation Measures 1, 3, 5, and 9 will be applied where necessary to mitigate impacts on authorized projects in Segment 2. For a detailed list of authorized projects for Segment 2, refer to Section 3.2.5.4.

Future Land Use

Overall residual impacts on future land-use projects for Alternative 2A: Proposed Action and Alternative 2B: Southern Route are anticipated to be similar to impacts on alternative routes described in Segment 1. Miles of future land-use projects crossed by the Proposed Action and alternative routes in Segment 2 are listed in Table 4-46. Agency-Required Mitigation Measures 1, 3, 5, and 9 will be applied where necessary to mitigate impacts on future land use in Segment 2.

4.3.5.5.2.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Existing Land Use

Impacts on general land-use types for Alternative 3A: Proposed Action and all alternative routes in Segment 3 are anticipated to be similar to those described for alternative routes in Segment 1. Alternative 3A: Proposed Action in Segment 3 crosses all general developed land-use types listed in Table 4-44, except for limber pine-juniper and grasslands. Agency-Required Mitigation Measures 1, 3, and 5 would be applied where necessary to mitigate impacts on general land-use types. Existing utility infrastructure crossed by Alternative 3A: Proposed Action in Segment 3 includes oil and gas pipelines and transmission lines. Existing utility infrastructure crossed or paralleled by the Lost Creek to Lost Cabin and Lost Creek to Highway 20/26 alternative routes include a compressor station, oil and gas pipelines, and transmission lines. Agency-Required Mitigation Measure 1 (sensitive resource avoidance) would be applied where the Project crosses existing oil and gas pipelines and transmission lines.

Authorized Projects

Overall residual impacts on BLM-authorized projects for Alternative 3A: Proposed Action and all alternative routes are anticipated to be similar to those alternative routes described in Segment 1. Impacts on authorized projects are included in Table 4-45. Agency-Required Mitigation Measures 1, 3, 5, and 9 will be applied where necessary to mitigate impacts on authorized projects in Segment 3. For a detailed list of authorized projects for Segment 3, refer to Section 3.2.5.4

Future Land Use

Overall residual impacts on future land-use projects for Alternative 3A: Proposed Action and all alternative routes in Segment 3 are anticipated to be similar to those alternative routes described in Segment 1. Miles of future land-use projects crossed by the Proposed Action and alternative routes in Segment 3 are listed in Table 4-46. Agency-Required Mitigation Measures 1, 3, 5, and 9 will be applied where necessary to mitigate impacts on authorized projects in Segment 3.

4.3.5.5.2.5 230-Kilovolt Transmission Line

The proposed alignment for the 230kV line does not cross any existing or RFFA land-use projects. The alignment does cross a BLM-authorized power transmission right-of-way, already leased by PacifiCorp.

4.3.5.5.2.6 Mainline Valve Distribution Lines

Though not anticipated, the MLV distribution lines could potentially affect or conflict with existing, authorized, and future land uses or projects. Without knowing the final location of the distribution lines, the amount of impact on or conflict with existing, authorized or future land-use projects from the construction of the distribution lines cannot be provided at this time. Refer to Section 2.2.1.4 for more detail. It is expected that the Applicant would resolve any conflicts regarding land ownership and access along the transmission line route, including any compensation for economic impacts on leaseholders. In general, the likelihood and potential for such conflict are low and the effects would be limited. With the availability of current technology, mining and oil and gas recovery still could occur in proximity to the transmission line.

Application of design features of the Proposed Action for environmental protection and agency-required mitigation measures to reduce impacts associated with construction of the distribution lines would be consistent with the rest of the Project. In addition, where the distribution lines would affect or conflict with an existing, authorized, or future land use or project, the distribution lines could be buried and MLVs may instead be powered through an on-site solar power system, which would effectively limit the amount of expected impact or conflict.

4.3.5.6 Summary Comparison of Alternative Routes

4.3.5.6.1 Parallel Facilities

In Segment 1, all alternative routes and route variations are located adjacent to existing pipeline rights-of-way to some extent (refer to Table 4-43). Alternative 1C: Figure Four is parallel to an existing right-of-way for approximately 40 percent of the route while Alternative 1A: Proposed Action is parallel for approximately 6 percent.

In Segment 2, both Alternative 2A: Proposed Action and 2B: Southern Route are located adjacent to existing pipeline rights-of-way. Also, both alternative routes parallel a 230kV transmission line for approximately 1.3 miles. Alternative 2B: Southern Route is parallel to an existing right-of-way for approximately 50 percent of the route while Alternative 2A: Proposed Action is parallel for approximately 35 percent of the route.

In Segment 3, all alternative routes and route variations are parallel to existing pipeline rights-of-way. Also, both alternative routes parallel 115kV and 230kV transmission lines ranging from 0.2 to 0.6 mile (refer to Table 4-43). Alternative 3B: Lost Creek to Lost Cabin parallels an existing facility for approximately 75 percent of the route. Alternative 3C: Lost Creek to Highway 20/26 parallels an existing facility for approximately 51 percent.

4.3.5.6.2 Existing Land Use

Moderate residual impacts on existing land use due to crossing the developed/disturbed land use would be similar for all pipeline alternative routes in Segment 1. Alternative 1A: Proposed Action and 1A Variation: Dry Basin Draw cross the least number of miles of this land-use type. Alternative 1C: Figure Four crosses the most developed/disturbed land-use type, primarily due to the alternative route length.

Moderate residual impacts on existing land use due to crossing the developed/disturbed land-use type would be the same for all alternative routes in Segment 2 because the alternative routes cross this land-use type in a similar location.

Moderate residual impacts on existing land use due to crossing the developed/disturbed land-use type would be similar for all alternative routes in Segment 3. However, Alternative 3C: Lost Creek to Highway 20/26 has moderate residual impacts for approximately half of alternative due to crossing this land-use type. Alternatives 3A: Proposed Action and 3B: Lost Creek to Lost Cabin cross less than 3 miles of this land-use type. The impacts could be greater for Alternative 3C: Lost Creek to Highway 20/26 because it crosses a more developed area. However, some existing land uses may be compatible with an underground pipeline.

4.3.5.6.3 Authorized Projects

Low residual impacts on authorized projects would be similar for all pipeline alternative routes in Segment 1. Alternative 1A: Proposed Action crosses the least number of miles of authorized projects and Alternative 1C: Figure Four crosses the most, primarily due to alternative route length.

Low residual impacts on authorized projects would be similar for all pipeline alternative routes in Segment 2. Alternative 2B: Southern Route crosses the least number of miles of authorized projects and Route 2A: Proposed Action crosses the most, primarily due to alternative route length.

Low residual impacts on authorized projects would be similar for all pipeline alternative routes in Segment 3. Alternative 3B: Lost Creek to Lost Cabin crosses the least number of miles of authorized projects and Alternative 3C: Lost Creek to Highway 20/26 crosses the most, primarily due to alternative route length.

4.3.5.6.4 Future Land Use

Low residual impacts on future land use would be similar for all pipeline alternative routes in Segment 1. Alternative 1A: Proposed Action crosses the least number of miles of future land uses. Alternative 1C: Figure Four crosses the most future land uses, primarily due to alternative route length.

Low residual impacts on future land use would vary for pipeline alternative routes in Segment 2. Alternative 2A: Proposed Action has 13.6 more miles of low impacts associated with crossing reasonably foreseeable future projects and pending projects in BLM's LR2000 system. This is because Alternative 2A: Proposed Action is in a more developed area with more future projects planned. However, some future land uses may be compatible with an underground pipeline.

Low residual impacts on future land use would be similar for all pipeline alternative routes in Segment 3. Alternative 3A: Proposed Action crosses the least number of miles of future land uses. Alternative 3C: Lost Creek to Highway 20/26 crosses the most future land uses, primarily due to alternative route length.

4.3.6 Livestock Grazing

4.3.6.1 Issues Identified for Analysis

Issues identified during agency coordination and public scoping included potential direct and indirect impacts on livestock grazing and management from the construction, operation, and maintenance of the Project, including:

- Interference with access to livestock operations,
- Increased mortality of livestock from increased traffic,
- Impacts on lambing and calving areas for livestock, and
- Potential for the spread of noxious and invasive weeds to impact quality of forage.

4.3.6.2 Types of Potential Effects

Impacts on livestock grazing, both direct and indirect, resulting from the construction, maintenance, and operation of the Project include:

Short term:

- Impact on soils and existing vegetation used for livestock grazing due to ground-disturbing activities
- Temporary reduction in forage availability in grazing allotments
- Temporary alteration of grazing patterns and locations
- Spread of noxious and invasive weeds from ground-clearing and construction activities
- Increased mortality of livestock due to increased traffic from the Project
- Interference with livestock operations, including lambing and calving areas, from Project construction, maintenance, and infrastructure

Long term:

- Loss of overall grazing allotment acreage and reduction in AUMs from permanent Project infrastructure

Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.6.3 Criteria for Assessing Impacts

Criteria were developed to assess the intensity of potential effects on livestock grazing associated with implementation of the Project (Table 4-47). These criteria form the baseline for determining whether impacts on alternative routes would occur at a high, moderate, or low level.

Table 4-47
Criteria for Assessing Level of Impacts Livestock Grazing

Level of Impacts	Description
High	▪ Areas where the Project would conflict physically and/or create a direct long-term conflict with existing rangeland and/or grazing allotment use, particularly during lambing and calving activities.
Moderate	▪ Areas where the Project would create a direct (short-term) and/or indirect (short- or long-term) conflict with existing rangeland and/or grazing allotment use and/or management. ▪ Areas where the Project would create a direct (short-term) and/or indirect (short- or long-term) conflict with planned rangeland and/or grazing allotment use and/or management
Low	▪ Areas where the Project would create a direct (short-term) and/or indirect (short- or long-term) conflict with existing rangeland or grazing allotments use and/or management (e.g., spread of noxious weeds on grazing, interference with livestock operations, mortality of livestock from increased traffic)

4.3.6.4 Mitigation Planning

Initial impacts are those effects resulting from the implementation of the Project, including implementation of design features of the Proposed Action for environmental protection (Table 2-18). Initial impacts were assigned using the criteria presented in Table 4-47. The specific design features of the Proposed Action for environmental protection relevant to livestock grazing include:

- **Design Feature 2 (wildlife and livestock – disturbance and harassment).** Applied to areas used for grazing allotments, particularly during lambing and calving activities. All employees, contractors, and site visitors would be instructed to avoid harassment and disturbance of livestock, especially during lambing and calving seasons. During construction, employee pets would not be permitted on-site; during operation, employee pets would be controlled to avoid harassment and disturbance to livestock.
- **Design Feature 3 (wildlife and livestock – vehicle collisions).** Applied to limit livestock mortality from vehicle collisions. Project personnel and contractors would be instructed (through signage and training) and required to adhere to a 35-mph speed limit in the Project area to ensure safe and efficient traffic flow and to reduce livestock collisions and disturbance and airborne dust.
- **Design Feature 7 (roads – general use).** Applied to limit livestock mortality and to minimize impacts on vegetation. This design feature would also reduce interference with livestock operations.
- **Design Feature 8 (roads maintenance).** Applied to minimize interference to livestock operations (e.g., access to operations).
- **Design Feature 9 (roads reclamation).** Applied to minimize impacts on vegetation used for livestock grazing.
- **Design Feature 10 (soils – erosion control).** Applied to minimize impacts on vegetation and water features used for livestock grazing and operations.
- **Design Feature 11 (soils – topsoil handling).** Applied to salvage and reapply topsoil from all excavation and construction activities (e.g., revegetation of forage for livestock).

- **Design Feature 13 (vegetation – noxious weeds).** Applied to limit the spread of noxious and invasive weeds in livestock forage vegetation.
- **Design Feature 14 (vegetation – general maintenance).** Applied as a quality assurance measure and to monitor and treat noxious and invasive weed species.
- **Design Feature 29 (waters – waterbodies and wetlands).** Applied to avoid or minimize impacts on bodies of water and wetlands used for livestock grazing operations.
- **Design Feature 30 (waters – waterbodies and wetlands [construction]).** Applied, through Applicant-committed BMPs, to protect surface water quality of bodies of water and wetlands used for livestock grazing operations.
- **Design Feature 33 (reclamation public access).** Applied to avoid livestock disruption of reclamation efforts.

Residual impacts represent anticipated impacts on livestock grazing resources that would remain after implementation of agency-required mitigation measures (refer to Table 4-2). The level of potential residual impacts on livestock grazing resources associated with implementation of the Project was assessed using the criteria presented in Table 4-47. The agency-required mitigation measures applied to avoid, reduce, or minimize impacts on livestock grazing resources include:

- **Agency-Required Mitigation Measure 1 (sensitive resource avoidance).** Applied where the Project could directly affect livestock or livestock operations, including lambing and calving areas and operations. Avoidance can be achieved by reducing the width of the right-of-way; micro-siting; or using alternative construction techniques, including horizontal drilling, to avoid impacts on livestock.
- **Agency-Required Mitigation Measure 3 (minimizing or avoiding disturbance to sensitive soils and vegetation).** Applied where the Project could directly affect grazing allotments managed for livestock, specifically in areas where soils and vegetation are particularly sensitive to disturbance (i.e., riparian areas).
- **Agency-Required Mitigation Measure 6 (minimize tree clearing).** Applied where the Project could affect riparian vegetation communities used for livestock grazing.
- **Agency-Required Mitigation Measure 8 (interim and intense reclamation).** Applied following construction to rectify the impacts of construction by repairing, rehabilitating, or restoring the vegetation communities where higher impacts have been identified; greater consideration for concentrated, or species explicit, reclamation treatments may be warranted to achieve management objectives or prescriptions for livestock grazing.

Table 4-48 includes types of livestock grazing resources affected by the implementation of the Project, initial and residual impacts, and the agency-required mitigation measures to be used.

Table 4-48
Summary of Initial and Residual Impacts on Livestock Grazing

Resource	Initial Impact	Agency-Required Mitigation Measure	Residual Impact
Grazing allotments	Moderate	1, 3, 6, 8	Low

NOTE: Initial impacts reflect implementation of the design features of the Proposed Action for environmental protection, which are considered to be part of the Applicant's Project description (and include the Applicant-committed measures [Appendix A]). Residual impacts reflect the anticipated effects that would remain after implementation of agency-required mitigation measures.

4.3.6.5 Results (Direct and Indirect Residual Effects)

Direct effects associated with livestock operations and grazing from the Project include clearing of vegetation used for livestock grazing for construction of the pipeline. The direct and indirect residual effects that would remain after mitigation are dependent on the recovery rate of key forage species from the revegetation efforts after construction. The majority of short-term and long-term impacts would occur in the pipeline right-of-way and staging areas. Direct residual effects from permanent Project infrastructure and roads could lead to a loss in overall grazing allotment acreage (Appendix E).

4.3.6.5.1 Grazing Allotments and Management

Table 4-49 includes impacts and miles of grazing allotments crossed by the Project by segment for all alternative routes and route variations. Refer to Map 4-2 for more information.

Table 4-49
Grazing Allotment Resources Inventory Data and Residual Impacts

Alternative Route	Total Miles	Grazing Allotments (miles)	Bureau of Land Management	State	Other	Residual Impacts (miles)[1]	
						None	Low
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant							
1A: Proposed Action	30.4	26.8	23.5	2.4	0.9	3.6	26.8
1A Variation: Dry Basin Draw	30.7	27.1	23.8	2.4	0.9	3.6	27.1
1B: Dry Piney	34.5	30.9	22.2	3.1	5.6	3.6	30.9
1C: Figure Four	38.5	35.0	30.4	2.1	2.5	3.5	35.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect							
2A: Proposed Action	129.1	129.1	121.5	6.9	0.7	0.0	129.1
2B: Southern Route	136.2	136.2	123.6	2.6	10.0	0.0	136.2
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect							
3A: Proposed Action	83.2	81.5	39.9	6.8	34.8	1.7	81.5
3B: Lost Creek to Lost Cabin	73.0	72.9	50.9	4.5	17.5	0.1	72.9
3C: Lost Creek to Highway 20/26	101.4	71.8	45.4	6.7	19.7	29.6	71.8

NOTE: [1]With the implementation of agency-required mitigation measures identified for this resource, no high or moderate impacts would be anticipated.

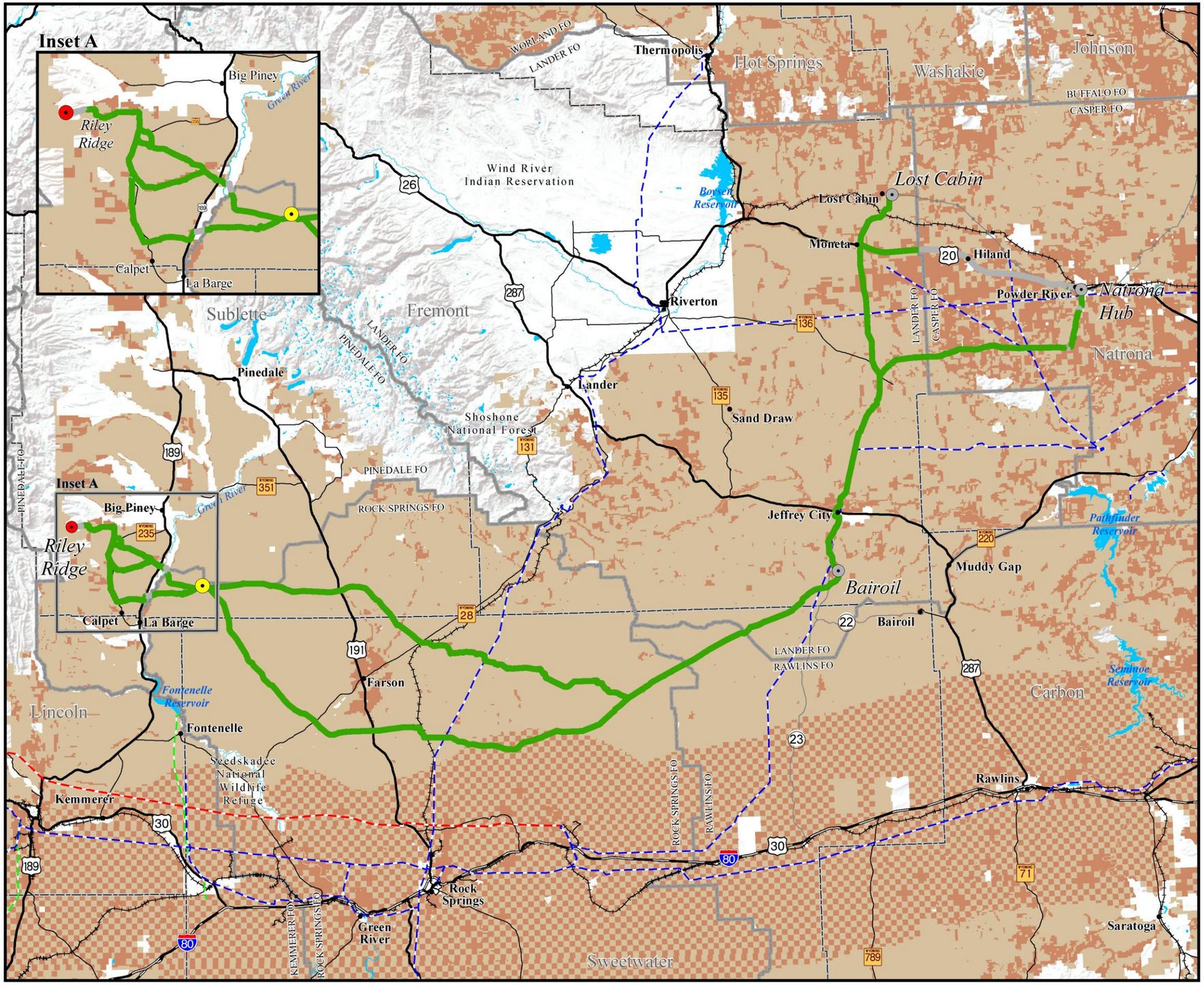
4.3.6.5.1.1 No Action Alternative

Under the No Action Alternative, the right-of-way grant on BLM-administered lands would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.6.5.1.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant and Injection Wells

No grazing allotments are located on the property leased for construction of the Riley Ridge Sweetening Plant and injection wells. Therefore, no impacts on livestock grazing are anticipated.



Map 4-2
Grazing Allotments

RILEY RIDGE TO NATRONA PROJECT

Grazing Allotments
- Grazing Allotment on Public Land
- Grazing Allotment on Private Land

Impact Levels
- Low
- No Identifiable

Project Features
- Riley Ridge Treatment Plant
- Proposed Riley Ridge Sweetening Plant
- Interconnect

General Reference
- City or Town
- 345kV Transmission Line
- 230kV Transmission Line
- 138kV Transmission Line
- Greencore Pipeline
- Railroad
- Interstate Highway
- U.S. Highway
- State Highway
- Other Road
- Lake or Reservoir
- County Boundary
- BLM Field Office Boundary

SOURCES:
Grazing Allotments, BLM 2013;
BLM Field Office Boundary, BLM 2008;
Transmission Lines and Substations as digitized by EPG, POWERmap Platts 2009;
Highways, Roads, and Railroads, ESRI 2013; Greencore Pipeline, SWCA 2015;
Water Features, ESRI 2008, USGS 2010; State and County Boundaries, ESRI 2013

Last Revised: February 19, 2015
Draft EIS: March 2018

0 5 10 20
Miles

THIS PAGE INTENTIONALLY LEFT BLANK

Segment 1 Pipeline Alternative Routes

Overall, initial short-term impacts from construction and ground-clearing activities on livestock operations and grazing allotments for Alternative 1A: Proposed Action and all alternative routes and route variations in Segment 1 are anticipated to be moderate. Applicant-committed design features, including agency-required mitigation measures, would be applied to reduce overall impacts, direct and indirect, on livestock operations and grazing allotments. After the application of design features and mitigation measures, along with vegetation reclamation, residual impacts are anticipated to be low. Impacts associated with livestock grazing and operations include temporary AUM reductions; temporary altering of grazing patterns and locations; permanent loss of acreage used for livestock grazing; potential spread of noxious and invasive weeds; and potential damage to rangeland improvements (e.g., water tanks, fences, gates, or other range improvements) from construction, operation, and maintenance activities. Rangeland improvements in the vicinity of construction activities would be documented and any damage would be repaired immediately (if livestock are present) or before the beginning of the next grazing season (if livestock are not present) to previous condition or current BLM standards. In some instances, the level of Project effects on smaller allotments could be greater than Project effects on larger allotments because the amount of forage disturbed would be a larger percentage of the available forage (compared to a larger allotment).

Per the POD and in addition to the Applicant-committed design features noted above, the following measures have been designed to eliminate, reduce, or compensate for Project impacts on livestock and ranch operators:

- Supplemental water sources will be provided for livestock in the event that project activities restrict access to existing water sources.
- Temporary fencing may be used to secure hazardous areas during construction. This would include excavated locations, staging areas, and areas with Project materials and equipment that could pose a hazard to livestock health. Fencing type would be decided on a site-specific basis but will commonly be 4-foot-high temporary (typically orange) snow fencing.
- Where necessary, cattle guards will be installed along new access roads to prevent cattle from wandering from their respective pastures.
- The Applicant will arrange for preconstruction consultation with the BLM and grazing permit holders to discuss dates of construction points of access, current grazing practices, and any additional site-specific mitigation that may be deemed necessary (e.g., to avoid areas such as stock driveways and calving and lambing grounds).
- The Applicant will discuss with the BLM and applicable grazing permit holders any changes of Project plans that would affect grazing operations.
- The Applicant will compensate ranch operators at fair market value for livestock that are injured as a result of Project activities, as well as for other temporary agricultural losses.

In critical areas, the Applicant will work with the BLM and affected livestock operators to reduce grazing impacts for the first two growing seasons following pipeline construction, using site-specific fencing and/or deferment of grazing by providing off-site grazing or forage.

All Project alternative routes in Segment 1 are anticipated to have similar impacts on grazing and livestock operations. Mileages crossed would vary due to length of the alternative route, with Alternative 1C: Figure Four having the most mileage crossed and Alternative 1A: Proposed Action having the least. Refer to Table 4-49 for detailed information related to miles crossed. Impacts on specific individual grazing allotments for Segment 1 are included in Appendix E.

4.3.6.5.1.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Impacts on livestock operations and grazing allotments for Alternative 2A: Proposed Action and Alternative 2B: Southern Route in Segment 2 are anticipated to be similar to impacts described for the alternative routes in Segment 1. Applicant-committed design features and agency-required mitigation measures will be applied to reduce overall impacts, direct and indirect, on livestock operations and grazing allotments in Segment 2. Impacts for all alternative routes in Segment 2 are anticipated to be similar to those in Segment 1. Alternative 2B: Southern Route crosses the most mileage managed for livestock in Segment 2 and Alternative 2A: Proposed Action crosses the least. Refer to Table 4-49 for detailed information and percentages related to miles crossed. Impacts on specific grazing allotments for Segment 2 are included in Appendix E.

4.3.6.5.1.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Impacts on livestock operations and grazing allotments for Alternative 3A: Proposed Action in Segment 3 are anticipated to be similar to impacts for the alternative routes described in Segment 1. Applicant-committed design features and agency-required mitigation measures will be applied to reduce overall impacts, direct and indirect, on livestock operations and grazing allotments. Impacts for all alternative routes in Segment 3 are anticipated to be similar to those in Segment 1. Mileage crossed will vary due to length of the alternative route with Alternative 3C: Lost Creek to Highway 20/26 having the most mileage crossed and Alternative 3A: Proposed Action having the least. Refer to Table 4-49 for detailed information and percentages related to miles crossed. Impacts on specific grazing allotments for Segment 3 are included in Appendix E.

4.3.6.5.1.5 230-Kilovolt Transmission Line

Impacts on livestock grazing and grazing operations, both direct and indirect, from the construction, operation, and maintenance of the Project include:

- Temporary reduction of forage availability in grazing allotments associated with pulling and tensioning sites, staging areas, access roads, and tower sites (short and long term)
- Potential spread of noxious and invasive species on grazing land, interference with livestock management, interference of access to livestock operations, and mortality of livestock from increased traffic (short-term)

4.3.6.5.1.6 Mainline Valve Distribution Lines

The MLV distribution lines would result in temporary and permanent disturbance to forage availability for livestock and grazing allotments. Though not anticipated, the MLV distribution lines also potentially could affect or conflict with lambing and calving areas or livestock operations. Without knowing the final location of the distribution lines, the amount of disturbance to livestock and grazing allotments resulting from the construction of the distribution lines cannot be provided at this time. Refer to Section 2.2.1.4 for more detail.

Application of design features of the Proposed Action for environmental protection and agency-required mitigation measures to reduce impacts associated with construction of the distribution lines would be consistent with the rest of the Project. In addition, where the MLV distribution lines would interfere with lambing and calving areas, or livestock operations, the distribution lines could be buried and the MLV may instead be powered through an on-site solar power system, which would effectively limit the amount of expected interference and disturbance. The Applicant will coordinate with grazing permittees to avoid calving and lambing season timing stipulations.

4.3.6.6 Summary Comparison of Alternative Routes

Regardless of the alternative route, the types of impacts on livestock grazing operations and grazing allotments would be similar. These include temporary reduction of forage availability in grazing allotments, temporary altering of grazing patterns and locations, temporary reduction in forage species used for livestock grazing, and potential spread of noxious and invasive weeds from construction and maintenance activities.

In Segment 1, Alternative 1C: Figure Four crosses more miles of grazing allotments (35.0 miles) than Alternative 1A: Proposed Action (26.8 miles).

In Segment 2, Alternative 2B: Southern Route crosses more miles of grazing allotments (136.2 miles) than Alternative 2A: Proposed Action (129.1 miles). Both pipeline alternative routes in this segment cross grazing allotments for the entire route length.

In Segment 3, Alternative 3A: Proposed Action crosses more miles of grazing allotments (81.5 miles) than Alternative 3C: Lost Creek to Highway 20/26 (71.8 miles).

For all pipeline alternative routes, low residual impacts are anticipated after the application of Applicant-committed design features (2, 3, 7, 8, 9, 10, 11, 13, 14, 29, 30, and 33) and agency-required mitigation measures (1, 3, 6, and 8). The application of these measures is anticipated to reduce long-term impacts on livestock operations and grazing allotments (refer to Section 4.3.6.4 for more detailed information regarding effectiveness of these measures).

4.3.7 National Trails System

4.3.7.1 Issues Identified for Analysis

The issues identified regarding National Trails are based on guidance provided in BLM Manual 6280 and include an assessment of potential impacts on National Trail management and components; scenic and recreation resources; historic and cultural resources; and biological, natural, and other resources. Each of these elements is briefly described below, and subsequently analyzed by National Trail and by Project segment.

- **National Trail Management and Components**. Issues regarding National Trail management and components are related to potential impacts on the management designations of National Scenic and Historic Trails. Potential associated impacts include non-compliance with National Trail comprehensive management plans, and non-compliance with local trail guidance in BLM RMPs, as well as impacts on high potential sites, impacts on high potential segments, and impacts on designated auto tour routes. Potential associated impacts also could include interference or incompatibility of the Project with the nature and purpose of a designated trail, impacts on the characteristics and components that supported the National Trail's designation, or impacts on the agency's ability to manage the National Trail for its designated purposes.
- **Scenic and Recreation Resources**. Issues regarding scenic resources differ from issues associated with the settings of historic properties in that scenery-related issues are strictly related to visual resource values and are not concerned with the historic integrity of the scenery. Associated impacts include a determination of the amount of visual change that would be perceived by modern day recreation-focused viewers seeking opportunities to vicariously experience the National Trail, as well as impacts on the scenic quality surrounding the National Trail. Impacts related to scenery include which SQRU and associated rating (Class A, B, and C) would be crossed (and to what degree, in miles), the compatibility of the Project's design with the existing landscape character, and the amount of impact on viewers recreating along the National

Trail. The amount of the Project (in miles) that these viewers would be able to see from National Trail-associated viewing locations (including the designated auto tour route) is also provided, based on a viewshed analysis from these viewing locations. These viewshed analyses were run using a viewer height of 5 feet 6 inches and were run out to a distance of 3 miles. To identify the extent of Project visibility along the designated auto tour route (a linear viewing location), an additional viewshed was run from the Project looking out to identify which portions of the designated auto tour route would have views of the Project and quantify this extent of Project visibility compared to the overall length of the designated auto tour route.

- **Historic and Cultural Resources**. Issues related to historic and cultural resources are associated with potential impacts on the characteristics of historic properties in the National Trail corridor or seen from the National Trail centerline. Associated impacts are focused on whether the construction or operation of the Project would modify the characteristics of the properties to the extent that the properties would no longer contribute to the NRHP eligibility of the National Trail that they are associated with. The analysis discloses whether there would be direct physical impacts on the historic properties or whether the Project would visually impact the settings of the historic properties. The NHT classifications of trails are also included where appropriate, including discussion on which trail segments have NHT classifications and whether the trail would be crossed by the Project or would only be in proximity to the Project. Additionally, a viewshed analysis was run using a viewer height of 5 feet 6 inches and was run out to a distance of 3 miles to quantify the extent of Project visibility (in miles) along these contributing trail segments.
- **Biological, Natural, and Other Resources**. Issues related to biological and natural resources are related to potential impacts on key natural features that contribute to the values and characteristics of each National Trail. Other resources could include the presence of landscape modifications, including development, facilities, and existing land uses. Valid existing rights or interests in land ownership could also be included, as well as variables such as sights, smells, and other experiences that would adversely affect the National Trail experience. The analysis is particularly focused on potential impacts on vegetation and riparian corridors that contribute to the characteristics of the trails.

4.3.7.2 Types of Potential Effects

The construction, operation, and maintenance of the Project could result in effects on National Scenic and Historic Trails where:

- The Project could substantially interfere with or be incompatible with the nature and purpose of a National Scenic or Historic Trail
- The Project could adversely modify the National Scenic or Historic Trail's resources, qualities, values, associated settings, or primary use or uses

Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.7.3 Criteria for Assessing Impacts

Criteria were developed in coordination with the BLM field offices within the analysis area, along with the National Transmission Support Team National Trails staff to assess the intensity of potential effects associated with the implementation of the Project (Table 4-50). These criteria form the baseline for determining whether an impact on the different National Scenic and Historic Trail resources would occur at a high, moderate, or low level.

Table 4-50 **Criteria for Assessing Level of Impacts on National Scenic and Historic Trails**	
Level of Impacts	**Description**
High	▪ National Trail Management and Components • Construction and operation of the Project would substantially interfere with, or be incompatible with, the intended experience of the National Trail, as expressed in the National Trail's nature and purpose. The Project would adversely affect the characteristics and components that supported the National Trail's designation and the agency's ability to manage the National Trail for the designated purposes. Impacts would not be able to be effectively mitigated.
High	▪ Scenic Resources • Contrast produced by the Project would demand attention and dominate views from the National Trail centerline where form, line, color, and texture of Project components would be incongruent with existing landscape or historic features. • High quality, diverse, and rare or unique scenery (Class A or B [BLM Manual H-8410-1]) would be modified where the setting is a defining factor for the high potential route segments or as seen from historic properties and/or interpretive areas or NST centerlines.
	▪ Historic and Cultural Resources • There would be an adverse effect on historic and cultural resources associated with the National Trail. Characteristics of historic properties located in the National Trail corridor or seen from the National Trail centerline would be modified to the extent that they would no longer contribute to the NRHP eligibility of the National Trail. Impacts could include direct impacts on historic properties or visual impacts on the settings of historic properties.
	▪ Recreation, including Travel Management • Intact resource values, including recreation and National Trail-related travel management opportunities and values, would be substantially compromised by the Project. These values would no longer contribute to the character of the National Trail.
	▪ Biological and Natural Resources • Natural values, including any key contributing values and characteristics, would be substantially compromised by the Project (e.g., a riparian area adjacent to a route segment follows what would be cleared for access roads). These values would no longer contribute to the character of the National Trail.
	▪ Other Landscape Elements • Presence of developments; facilities; landscape modifications; existing land uses; valid existing rights; surface, subsurface, or other interests in land ownership; and other variables, such as sights, smells, and other experiences, would adversely affect the National Trail experience. • Project facilities would not be located in proximity to or parallel with landscape modifications that exhibit similar form, line, color, and texture.
Moderate	▪ National Trail Management and Components • Construction and operation of the Project would somewhat interfere with, or be incompatible with the intended experience of the National Trail, as expressed in the National Trail's nature and purpose. The Project would affect the characteristics and components that supported the National Trail's designation and the agency's ability to manage the National Trail for the designated purposes. Agency-required mitigation measures may or may not be necessary.
	▪ Scenic Resources • Contrast produced by the Project would attract attention from viewers using the National Trail centerline, and Project components would be codominant with existing landscape features. • The inherent quality of interesting, but not outstanding, landscapes (Class B or C) would be modified as seen from historic properties and/or interpretive areas or NST centerlines.

Table 4-50
Criteria for Assessing Level of Impacts on National Scenic and Historic Trails

Level of Impacts	Description
Moderate	▪ Historic and Cultural Resources • There would be an adverse effect on historic and cultural resources associated with the National Trail. Characteristics of historic properties located in the National Trail corridor or seen from the National Trail centerline would be modified to the extent that the properties may no longer contribute to the NRHP eligibility of the National Trail, although the effects on these sites could be minimized. No direct impacts on historic properties would occur; however, visual impacts on the settings of historic properties would occur.
	▪ Recreation, including Travel Management • Intact resource values, including recreation and National Trail-related travel management opportunities and values, would be modified by the Project but would remain suitably intact and continue to contribute to the character of the National Trail.
	▪ Biological and Natural Resources • Natural values, including any key contributing values and characteristics, would be modified by the Project but would remain suitably intact and continue to contribute to the character of the National Trail.
	▪ Other Landscape Elements • Presence of developments; facilities; landscape modifications; existing land uses; valid existing rights; surface, subsurface, or other interests in land ownership; and other variables, such as sights, smells, and other experiences, may negatively affect the National Trail experience. • Project facilities would be located in proximity to, or parallel with (but not immediately adjacent to), landscape modifications that exhibit similar form, line, color, and texture.
Low	▪ National Trail Management and Components • Construction and operation of the Project would not interfere with, or be incompatible with, the intended experience of the National Trail, as expressed in the National Trail's nature and purpose. The Project would not adversely affect the characteristics and components that supported the National Trail's designation or the agency's ability to manage the National Trail for the designated purposes. Impacts would be able to be effectively mitigated. Agency-required mitigation measures would not likely be necessary.
	▪ Scenic Resources • Contrast produced by the Project would not be readily apparent from National Trail centerlines and would be subordinate in the context of existing conditions. • Minimal change would occur to the existing character of interesting and common landscapes (Class B or C) as seen from historic properties/interpretive areas or scenic National Trail centerlines.
	▪ Historic and Cultural Resources • There would be no adverse effect on historic and cultural resources associated with the trail. Characteristics of historic properties located in the trail corridor or seen from the trail centerline would be modified, but their ability to contribute to the NRHP eligibility of the trail would not be affected. No direct impacts on historic properties would occur, and visual impacts on the settings of historic properties would be minimal.
	▪ Recreation, including Travel Management • Intact resource values, including recreation and National Trail-related travel management opportunities and values, would be modified negligibly by the Project. Contributing values would continue to define the character of the National Trail.
	▪ Biological and Natural Resources • Natural values, including any key contributing values and characteristics would be modified negligibly by the Project. Contributing values would continue to define the character of the National Trail.

Table 4-50 Criteria for Assessing Level of Impacts on National Scenic and Historic Trails	
Level of Impacts	**Description**
Low	▪ Other Landscape Elements • Presence of developments; facilities; landscape modifications; existing land uses; valid existing rights; surface, subsurface, or other interests in land ownership; and other variables, such as sights, smells, and other experiences, would not negatively affect the National Trail experience. • Project facilities would be located in proximity to or parallel to landscape modifications that exhibit similar form, line, color, and texture, or screened from viewing locations associated with the National Trail such that the landscape is perceived to be unaltered.

4.3.7.4 Mitigation Planning

To determine initial impacts on National Scenic and Historic Trails, the first level of mitigation was applied Project-wide as part of the design features of the Proposed Action and to the extent practicable, Appendix 1 – Design Features and Best Management Practices for National Trails and Associated Resources (BLM Manual 6280). Agency-required mitigation measures (Table 4-2) were considered on a case-by-case basis based on the level of initial impacts or to mitigate site-specific impacts. These were applied to reduce impacts in locations where potential high and moderate initial impacts on National Scenic and Historic Trail resources were identified. Off-site mitigation may be applied, where feasible and through negotiations with the Applicant, for the life of the development in an effort to offset significant or high impacts of the Project that are unable to be mitigated. The agency-required mitigation measures applied to avoid, reduce, or minimize impacts on National Scenic and Historic Trails resources include:

- **Agency-Required Mitigation Measure 1 (sensitive resource avoidance).** Applied where the Project could directly affect contributing NHT segments (including construction access) to avoid placement of above-ground facilities in visually sensitive areas, micro-siting of the alignment to reduce visual contrast introduced by the Project, and aligning construction access routes to avoid crossing contributing NHT segments. Additionally, the pipeline or associated facilities at crossings of the NHT could be realigned to avoid visually disturbing contributing NHT segments as well as to meet BLM RMP direction.
- **Agency-Required Mitigation Measure 2 (minimize construction on greater slopes)**. Applied in areas where the construction of access roads would require switchbacks and additional areas to be graded. The mitigation measure would reduce contrast created by new access roads through the reduction of earthwork in sloped areas where grading could expose underlying soils, which would increase color, form, and texture contrast.
- **Agency-Required Mitigation Measure 3 (minimizing or avoiding disturbance to sensitive soils and vegetation).** Applied where existing access would potentially need to be widened or upgraded for construction and maintenance. It would reduce visual contrast, particularly modifications to the existing landscape's line and color elements, by reducing the widening and additional clearing of adjacent vegetation for access, as well as minimizing the area of disturbance in characteristic vegetation communities.
- **Agency-Required Mitigation Measure 4 (blend road cuts and grading).** Applied where grading in steep rocky areas creates strong visual contrast in the landscape. Blending and/or coloring areas of cut and fill would reduce contrast between the exposed ground and the surrounding environment.

- **Agency-Required Mitigation Measure 5 (overland access).** Applied where the Project would generate additional long-term visual contrast through the removal of slow-to-regenerate vegetation communities as part of the construction of access roads. The construction contractor would use overland access, such as drive-and-crush, driving over vegetation where the vehicles would access the site, rather than blading and grading, thus modifying the landscape less significantly.
- **Agency-Required Mitigation Measure 6 (minimize tree clearing).** Applied where the Project crosses overstory vegetation (e.g., pinyon-juniper or riparian corridors). It would reduce impacts by decreasing visual contrast created by the removal of overstory vegetation (trees) and the hard visual line created by the cleared right-of-way/forest interface. In addition to reducing visual contrast, this agency-required mitigation measure would minimize disturbance in characteristic vegetation communities.
- **Agency-Required Mitigation Measure 8 (interim or intense reclamation).** Applied where the Project would generate long-term visual contrast through the removal of slow-to-regenerate vegetation communities and where this contrast would be inconsistent with a Scenic and/or Historic Trail's nature and purpose. Through the application of more intensive reclamation techniques, the visual contrast introduced by the Project would be diminished and begin to blend with the existing landscape's form, line, color, and texture.
- **Agency-Required Mitigation Measure 9 (minimize new or improved accessibility).** Applied where access roads that are needed for construction, but not for maintenance, would be rehabilitated. It would reduce the modification of the line and color elements of visual contrast, in particular, where road construction would occur in slow-to-regenerate vegetation communities.

4.3.7.5 Results (Direct and Indirect Residual Effects)

The analysis for each Scenic and/or Historic Trail begins with a summary table that includes the miles of residual impacts by alternative. These impact levels are based on the definitions described in Table 4-50 on Scenic and/or Historic Trail management, as well as specific resource components, after the application of agency-required mitigation measures

The assessment of impacts on NHTs began with a baseline determination of the degree of contrast expected by the Project components (Project contrast) completed for each one-tenth mile of the Project. This analysis included an assessment of both structure contrast and landscape contrast to determine Project contrast using GIS modeling. While structure contrast was based on expected degree of contrast between proposed above-ground facilities and their relationship to existing built features, landscape contrast was based on expected degree of change to existing landforms and vegetation, including the relative revegetation period of the vegetation communities crossed. The degree of Project contrast was incorporated into the NHTs analysis by comparing their physical proximity to the various NHT-related viewing locations (e.g., high potential sites, high potential segments, auto tour routes, associated sites, etc.), as well as the compatibility of the Project's design with the existing landscape character and historic setting. The physical proximity of the NHT components to the Project, and relative level of Project contrast determined, directly affects the level of impact on the NHT components, because the degree of contrast experienced decreases as viewing distance from the NHT components increases. Overall impact levels on NHTs were, therefore, based on GIS modeling that combined overall Project contrast with NHT-related influence (distance) zones—supplemented with comparing the degree of Project contrast with the existing landscape character to also include impacts on overall NHT setting. These impacts were then reviewed to ensure that impacts were being accurately portrayed, after which agency-required mitigation measures were applied as described above. The residual impact levels displayed in the following tables are those impacts remaining after agency-required mitigation measures were applied.

Inventory and impact results for this section are displayed on MV-6.

4.3.7.5.1 Oregon National Historic Trail

A summary of miles of each impact level, by alternative, are described in Table 4-51.

Table 4-51
Oregon National Historic Trail Residual Impacts

Alternative Route	Total Miles	Residual Impacts (miles)			
		High	Moderate	Low	No Impact
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	30.4	0.0	0.0	0.0	30.4
1A Variation: Dry Basin Draw	30.7	0.0	0.0	0.0	30.7
1B: Dry Piney	34.5	0.0	0.0	0.0	34.5
1C: Figure Four	38.5	0.0	0.0	0.0	38.5
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	129.1	0.0	8.2	2.4	118.5
2B: Southern Route	136.2	0.0	2.8	3.8	129.6
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	83.2	0.0	2.7	7.4	73.1
3B: Lost Creek to Lost Cabin	73.0	0.0	2.7	7.4	62.9
3C: Lost Creek to Highway 20/26	101.4	0.0	2.7	7.4	91.3

NOTE: "No Impact" indicates miles of the Project located outside of the trail-specific study corridor and, therefore, impacts were not identified for these areas.

4.3.7.5.1.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.7.5.1.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant and Injection Well Sites

No National Trail segments or related resources are located at the proposed Riley Ridge Sweetening Plant or injection well sites. Therefore, no impact on the National Trail System is anticipated.

Segment 1 Pipeline Alternative Routes

The Oregon NHT is not adjacent to Segment 1; therefore, no identifiable impacts on the Oregon NHT are anticipated for any of the Segment 1 alternative routes.

4.3.7.5.1.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Trail Management and Components

Alternative 2A: Proposed Action crosses the South Pass High Potential Route Segment and Auto Tour Route in areas with limited cultural modifications. Based on the WYCRO data, Alternative 2A: Proposed Action also would directly cross one contributing segment (48SW827). One additional contributing segment is located 2.9 miles southwest of the alternative. During the NHTs inventory (Rockwell et al.

2012), another contributing segment (48SW827_444) was documented to overlap and extend from 48SW827_131 northeast, thus also crossing this alternative route (Rockwell et al. 2012). Based on these recordings, another contributing segment (48SW827_442) is located 1.5 miles northeast of the alternative route. The high potential trail segment crossed by Alternative 2A: Proposed Action is identified in the NPS Trail Management Plan.

The Project would introduce geometric forms and linear elements not commonly found in the area. The area being crossed is mostly intact with very few modifications.

Application of agency-required mitigation measures, including sensitive resource avoidance (Agency-Required Mitigation Measure 1), applying interim or intense reclamation (Agency-Required Mitigation Measure 8), using overland access (Agency-Required Mitigation Measure 5), and minimizing new or improved accessibility (Agency-Required Mitigation Measure 9), would reduce the Project's impacts on the Oregon NHT. The sensitive resource avoidance measure would also include boring under NHT segments for a minimum or 0.25 mile on either side of the NHT and avoiding the siting of construction access routes over contributing trail segments to assure that the Project would be consistent with the BLM Rock Springs RMP. Considering application of these mitigation measures, the Project would still modify the experience along the NHT, but the NHT's nature and purpose would not be substantially compromised. These modifications to the NHT experience would occur initially until intense reclamation efforts successfully blend the Project's geometrically cleared right-of-way with the existing landscape outside of the area where the Project was bored under the NHT. The Parting of the Ways site is located approximately 4 miles from Alternative 2A: Proposed Action and, due to the distance and screening opportunities, would not be affected by the Project.

Impacts associated with Alternative 2B: Southern Route are similar to the impacts of Alternative 2A: Proposed Action but occur in a smaller geographic area due to the colocation of the Big Sandy to Green River High Potential Route Segment and the auto tour route. Additionally, Alternative 2B: Southern Route crosses a noncontributing trail segment, whereas Alternative 2A: Proposed Action crosses a segment determined to be contributing as previously described. It is important to note that both alternative routes follow existing utility corridors within the Lander Field Office, as required by the BLM Lander RMP. Based on the anticipated impacts, both alternative routes of the Project are expected to conform to the BLM Lander RMP and the BLM Rock Springs RMP.

Scenic and Recreation Resources

Alternative 2A: Proposed Action would introduce geometric forms into Class B and C landscapes (refer to Section 3.2.19.3.1 for a description of Class A, B, and C landscapes) through rural scenery with stippled mounds of sagebrush and black sagebrush with limited existing cultural modifications. Through the application of agency-required mitigation, as described above, the Project would begin to blend with the existing landscape character. Impacts associated with Alternative 2B: Southern Route are less intense than the impacts of Alternative 2A: Proposed Action as only Class C landscapes would be crossed. Miles of BLM SQRUs crossed by the Project, by alternative, are described in Table 4-52. (Refer to Section 3.2.19.5 Scenery description for Segment 3)

Table 4-52
Oregon National Historic Trail Scenic Quality Rating Units for Segment 2

Alternative Route	Total Miles	Scenic Quality Rating Class Crossed (miles)		
		A	B	C
2A: Proposed Action	10.6	0.0	3.0	7.6
2B: Southern Route	6.6	0.0	0.0	6.6
NOTE: Mileages equal total miles of trail-specific study corridor and not the total length of the alternative.				

Impacts on trail-associated viewers (e.g., viewers using the auto tour route, historic trail segments, and adjacent recreation areas) resulting from Alternative 2A: Proposed Action would be most intense within 0.5 mile of the Project where the Project would attract the attention of viewers. Through intense reclamation efforts, the Project would over time begin to blend with landscapes visible from these locations. These trail-associated viewers would view approximately 8.6 miles of the 10.5 miles of the Project within the trail study corridor with views of the remaining portion of the Project screened by topography. Additionally, of the 7.7 miles of the auto tour route in the trail study corridor, 5.3 miles would have potential views of the Project. No historic trail-associated special designations would be affected in this Project segment.

Impacts associated with Alternative 2B: Southern Route are similar to the impacts of Alternative 2A: Proposed Action, except trail-associated viewers would view approximately 3.9 miles of the 6.6 miles of the Project within the trail visual corridor and 3.3 miles of the 6.1 miles of the auto tour route within the trail study corridor, due to the effects of topographic screening. Miles of the Project in each Project-level distance zone, from trail-associated viewers, are described in Table 4-53.

Table 4-53
Oregon National Historic Trail Viewers for Segment 2

Alternative Route	Total Miles	Project-Level Distance Zone from Trail-Associated Viewers (miles)				
		0 to 0.5 mile	0.5 to 1 mile	1 to 2 miles	2 to 3 miles	3 plus miles
2A: Proposed Action	10.6	3.5	2.9	2.4	1.8	0.0
2B: Southern Route	6.6	1.0	1.1	2.1	2.3	0.1

NOTE: Mileages equal total miles of trail-specific study corridor and not the total length of the alternative.

Historic and Cultural Resources

Alternative 2A: Proposed Action crosses an NHT Class II trail segment and be visible from 3.5 miles of the 6.8 miles of NHT Class I and II segments (Refer to Table 3-65) in the historic trail study corridor with views from the remaining segments screened by topography. In the area where Alternative 2A: Proposed Action crosses the Oregon NHT, the historic landscape setting of the trail and trail-related features appears to be generally intact—appearing much as it would have during the trail's period of significance. The only visual intrusions within the historic setting are small unpaved county roads, which do not detract considerably from the historic setting. To avoid direct impacts on the contributing historic trail segments and to assure that the Project would be consistent with the BLM Rock Springs RMP, a sensitive resource avoidance measure would include boring under NHT segments for a minimum or 0.25 mile on either side of the NHT and avoiding the siting of construction access routes over contributing trail segments. The introduction of the Project would modify the historic setting, but through intense reclamation efforts, the Project would begin to blend with the existing setting, thus diminishing its long-term effect on these resources.

Impacts associated with Alternative 2B: Southern Route would be somewhat similar to those discussed for Alternative 2A: Proposed Action, although 2.2 miles of the 5.3 miles of NHT Class I and II segments would have views of the Project with views from the remaining segments screened by topography. Trail-specific sites were also identified along Alternative 2B: Southern Route and are associated with the Oregon NHT (48SW827 [Mormon Pioneer NHT]). Two of these sites refer to the NRHP-eligible Simpson's Hollow, or historic Mormon War battlefield (48SW1818), and Mormon Knolls. The exact location of the historic Simpson's Hollow site is not known, but the approximate location is 1.0-mile northeast of the centerline of Alternative 2B: Southern Route along State Highway 28. The Mormon Knolls site, which includes a series of natural landmarks identified by emigrants using the Oregon NHT, sits 2.8 miles southwest of the alternative route. The third site identified in proximity (500 feet) to the Oregon NHT is the NRHP-eligible Wagon Train Burning (48SW6470) (Ollie et al. 2016). This is a purported location where military supply wagons were burned during the Mormon War. An additional

site identified as possibly located along the Emigrant NHTs is McMoty Grave (48SW4150) (Ollie et al. 2016). The historic gravesite was recommended as unevaluated.

Although the level of impact on the trails being crossed by Alternative 2B: Southern Route would be lower due to the level of cultural modification in the area, agency-required mitigation measures would be applied as they would for the Oregon NHT section crossed by Alternative 2A: Proposed Action—reducing the amount and duration the disturbances would be visible.

Biological, Natural, and Other Resources

Alternative 2A: Proposed Action would modify characteristic landscapes associated with the Oregon NHT, including sagebrush and desert scrub landscapes, as well as riparian corridors. Minimizing vegetation clearing and using intense reclamation efforts would be implemented to reduce effects on these vegetation communities, as well as reduce effects on other historic trail resources.

Impacts associated with Alternative 2B: Southern Route are similar to the impacts discussed for Alternative 2A: Proposed Action.

4.3.7.5.1.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Trail Management and Components

Alternative 3A: Proposed Action would not cross any contributing historic trail segments. In accordance with the BLM Lander RMP direction to cross the NHT Management Corridor only in designated corridors, it would however cross the South Pass High Potential Route Segment and Auto Tour Route in proximity to existing pipelines, a 230kV transmission line, and development adjacent to Jeffrey City within the Lost Creek designated utility corridor. Due to this level of existing modification adjacent to the Project, the trail's nature and purpose would not be adversely affected. Views from the Three Crossings/Deep Sand Route High Potential Historic Site also would not be adversely affected due to the extent of existing development, as well as visual screening afforded by the foothills of the Granite Mountains. Impacts associated with the other alternative routes would be the same as the impacts of Alternative 3A: Proposed Action.

Scenic and Recreation Resources

Alternative 3A: Proposed Action would introduce geometric forms into Class B and C landscapes that already include existing linear utility development. Based on the extent of existing modifications to the landscape, the Project would introduce elements similar to the pipelines already traversing these landscapes. Impacts associated with the other alternative routes would be the same as the impacts of Alternative 3A: Proposed Action. Miles of BLM SQRUs crossed by the Project, by alternative, are described in Table 4-54.

Table 4-54
Oregon National Historic Trail Scenic Quality Rating Units for Segment 3

Alternative Route	Total Miles	Scenic Quality Rating Class Crossed (miles)		
		A	B	C
3A: Proposed Action	10.1	0.0	4.8	5.3
3B: Lost Creek to Lost Cabin	10.1	0.0	4.8	5.3
3C: Lost Creek to Highway 20/26	10.1	0.0	4.8	5.3

NOTE: Mileages equal total miles of trail-specific study corridor and not the total length of the alternative.

Impacts on trail-associated viewers (e.g., viewers using the auto tour route, historic trail segments, and adjacent recreation areas) resulting from Alternative 3A: Proposed Action would be most intense within 0.5 mile of the Project, where additional geometric forms are introduced into the viewshed, similar to existing line utility development. These trail-associated viewers would view approximately 5.9 miles of the 10.0 miles of the Project within the trail study corridor with views of the remaining portion of the Project screened by topography. Additionally, of the 6.7 miles of the auto tour route in the trail study corridor, 3.5 miles would have potential views of the Project with the remaining portion screened by topography. These effects would occur within the NHTs Destination SRMA and ERMA. Impacts associated with the other alternative routes would be the same as the impacts of Alternative 3A: Proposed Action. Miles of the Project in each Project-level distance zone, from trail-associated viewers, are described in Table 4-55.

Table 4-55
Oregon National Historic Trail Viewers for Segment 3

Alternative Route	Total Miles	Project-Level Distance Zone from Trail-Associated Viewers (miles)				
		0 to 0.5 mile	0.5 to 1 mile	1 to 2 miles	2 to 3 miles	3 plus miles
3A: Proposed Action	10.1	1.1	2.6	4.0	2.1	0.3
3B: Lost Creek to Lost Cabin	10.1	1.1	2.6	4.0	2.1	0.3
3C: Lost Creek to Highway 20/26	10.1	1.1	2.6	4.0	2.1	0.3

NOTE: Mileages equal total miles of trail-specific study corridor and not the total length of the alternative.

Historic and Cultural Resources

Alternative 3A: Proposed Action would include several historic trail crossings associated with the Oregon NHT (48FR736). Three contributing segments of the trail (48FR736) would be within the study area in the vicinity of the Sweetwater River. One contributing segment of the Oregon NHT would be crossed by this alternative route on the north side of the river, and the other two contributing segments would be located over 1 mile to both the east and west.

Eight trail-specific sites would be located along Alternative 3A: Proposed Action. These would be associated with the NRHP-eligible Three Crossings Stage Station (48FR231) and include multiple crossings of the Sweetwater River (Three Crossings [second and third crossing] and First Crossing of Sweetwater), nearby inscriptions, and the grave of Private Bennett Tribbett, a member of Company B of the First Battalion, who died at the stage station (Ollie et al. 2016). NHT-related sites would be from 1 mile to 3 miles east of Alternative 3A: Proposed Action.

Other sites along Alternative 3A: Proposed Action would include the Three Crossings location and an associated cemetery (48FR6768). A grave site called Miller's Grave, named after a ranch foreman from an early cattle operation in Fremont County, would lie between the Second and Third Crossings of the Oregon NHT (48FR736). Sites containing historic inscriptions would also occur along the trail in this area as well (48FR1321, 48FR6697, 48FR6768, 48FR6777, 48FR6778, 48FR6780, 48FR6807, 48FR6813, and 48FR6808 to 48FR6900) (Ollie et al. 2016). No additional information was available for the aforementioned sites (grave sites and historic rock art) to determine any association with the NHT. In addition to these sites, the town of Jeffrey City is within proximity of the trail, as is the John Kirk Ranch, but the eligibility of these sites is unknown (Ollie et al. 2016). Based on the sites' period of significance, they appear to be unrelated to the trail itself.

In the area where Alternative 3A: Proposed Action crosses the Oregon NHT, the historic landscape setting of the trail and trail-related features is not generally intact and does not appear as it would have during the trail's period of significance. Visual intrusions that degrade the historic setting include existing

pipeline development, an existing 230kV transmission line, and development adjacent to Jeffrey City within the Lost Creek designated utility corridor. To avoid direct impacts on the contributing historic trail segments and to assure that the Project would be consistent with the BLM Lander RMP, a sensitive resource avoidance measure would include boring under NHT segments for a minimum or 0.25 mile on either side of the NHT and avoiding the siting of construction access routes over contributing trail segments. The introduction of the Project would not appreciably modify the historic setting.

Impacts on Oregon NHT sites and segments associated with Alternative 3B: Lost Creek to Lost Cabin, and Alternative 3C: Lost Creek to Highway 20/26 would be the same as those identified for Alternative 3A: Proposed Action.

Biological, Natural, and Other Resources

Alternative 3A: Proposed Action would further modify characteristic landscapes associated with the Oregon NHT, including the crossing of the Sweetwater River and the sagebrush plains located among the peaks of the Granite Mountains. These modifications would be similar to those associated with existing linear utility development in the area. Impacts associated with the other alternative routes would be the same as the impacts of Alternative 3A: Proposed Action.

4.3.7.5.1.5 230-Kilovolt Transmission Line

The 230kV transmission line is not within the 3.0-mile viewshed of the Oregon NHT; therefore, no identifiable impacts on the Oregon NHT are anticipated.

4.3.7.5.1.6 Mainline Valve Distribution Lines

The introduction of distribution power lines to serve MLVs would include vertical poles, right-of-way vegetation clearing, and access roads, which would contrast with the existing historic trail setting. The scale of the power lines is similar to those present in other portions of the study area providing power to oil and gas wells, ranches, and other facilities requiring power. To limit the impact of this Project component on historic trail resources, including historic trail segments and cultural sites, the distribution line could be buried or power could be generated via solar power at the MLV itself. Since the burial of the line would still introduce a narrow geometrically cleared right-of-way, smaller in scale than the Project, the preference would be to use solar power at any MLVs within view of the Oregon NHT and its associated resources to limit the additive effect of introducing multiple cleared rights-of-way. The potential glare from these solar panels would be considered in the siting and design of the panels to minimize any impacts on the Oregon NHT.

4.3.7.5.2 Mormon Pioneer National Historic Trail

A summary of miles of each impact level, by alternative, are described in Table 4-56.

Table 4-56
Mormon Pioneer National Historic Trail Residual Impacts

Alternative Route	Total Miles	Residual Impacts (miles)			
		High	Moderate	Low	No Impact
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	30.4	0.0	0.0	0.0	30.4
1A Variation: Dry Basin Draw	30.7	0.0	0.0	0.0	30.7
1B: Dry Piney	34.5	0.0	0.0	0.0	34.5
1C: Figure Four	38.5	0.0	0.0	0.0	38.5

Table 4-56 Mormon Pioneer National Historic Trail Residual Impacts					
Alternative Route	**Total Miles**	**Residual Impacts (miles)**			
		High	**Moderate**	**Low**	**No Impact**
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	129.1	0.0	8.2	2.4	118.5
2B: Southern Route	136.2	0.0	2.8	3.8	129.6
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	83.2	0.0	2.7	6.9	73.6
3B: Lost Creek to Lost Cabin	73.0	0.0	2.7	6.9	63.4
3C: Lost Creek to Highway 20/26	101.4	0.0	2.7	6.9	91.8
NOTE: "No Impact" indicates miles of the Project located outside of the trail-specific study corridor and, therefore, impacts were not identified for these areas.					

4.3.7.5.2.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under Alternative 1A: Proposed Action would not be approved. The Project would not be developed and the environment will remain as it presently exists.

4.3.7.5.2.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant and Injection Well Sites

No National Trail segments or related resources are located at the proposed Riley Ridge Sweetening Plant or injection well sites. Therefore, no impact on the National Trail System is anticipated.

Segment 1 Pipeline Alternative Routes

The Mormon Pioneer NHT is not adjacent to Segment 1; therefore, no identifiable impacts on the Mormon Pioneer NHT are anticipated for any of the Segment 1 alternative routes.

4.3.7.5.2.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Impacts on the Mormon Pioneer NHT are similar to the impacts on the Oregon NHT in this Project segment for both Alternatives 2A: Proposed Action and 2B: Southern Route. In addition to proximity to NHT Class II trail traces, Alternative 2B: Southern Route is located approximately 1 mile from Simpson's Hollow and 3 miles from the Mormon Knolls trail-associated cultural sites, which would experience similar impacts as the NHT Class II trail traces.

4.3.7.5.2.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Impacts on the Mormon Pioneer NHT are similar to the impacts on the Oregon NHT in this Project segment for both Alternative 3A: Proposed Action and the other alternative routes. (Refer to Section 4.3.7.5)

4.3.7.5.2.5 230-Kilovolt Transmission Line

The 230kV transmission line is not within the 3.0-mile viewshed of the Mormon NHT; therefore, no identifiable impacts on the Mormon NHT are anticipated.

4.3.7.5.2.6 Mainline Valve Distribution Lines

Impacts on the Mormon Pioneer NHT are similar to the impacts on the Oregon NHT from this Project component (Refer to Section 4.3.7.5).

4.3.7.5.3 California National Historic Trail and Sublette Cutoff

A summary of miles of each impact level, by alternative, are described in Table 4-57.

Table 4-57
California National Historic Trail and Sublette Cutoff Residual Impacts

Alternative Route	Total Miles	Residual Impacts (miles)			
		High	Moderate	Low	No Impact
California National Historic Trail					
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	30.4	0.0	0.0	7.7	22.7
1A Variation: Dry Basin Draw	30.7	0.0	0.0	7.7	23.0
1B: Dry Piney	34.5	0.0	0.0	7.7	26.8
1C: Figure Four	38.5	0.0	0.0	7.7	30.8
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	129.1	0.0	8.2	2.4	118.5
2B: Southern Route	136.2	0.0	2.8	3.8	129.6
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	83.2	0.0	2.7	7.4	73.1
3B: Lost Creek to Lost Cabin	73.0	0.0	2.7	7.4	62.9
3C: Lost Creek to Highway 20/26	101.4	0.0	2.7	7.4	91.3
Sublette Cutoff					
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	30.4	0.0	0.0	0.0	30.4
1A Variation: Dry Basin Draw	30.7	0.0	0.0	0.0	30.7
1B: Dry Piney	34.5	0.0	0.0	0.0	34.5
1C: Figure Four	38.5	0.0	0.0	0.0	38.5
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	129.1	0.0	5.6	1.7	121.8
2B: Southern Route	136.2	0.0	2.5	4.1	129.6
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	83.2	0.0	0.0	0.0	83.2
3B: Lost Creek to Lost Cabin	73.0	0.0	0.0	0.0	73.0
3C: Lost Creek to Highway 20/26	101.4	0.0	0.0	0.0	101.4

NOTE: "No Impact" indicates miles of the Project located outside of the trail-specific study corridor and, therefore, impacts were not identified for these areas.

4.3.7.5.3.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment will remain as it presently exists.

4.3.7.5.3.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction and Injection Well Sites

No National Trail segments or related resources are located at the proposed Riley Ridge Sweetening Plant or injection well sites. Therefore, no impact on the National Trail System is anticipated.

Segment 1 Pipeline Alternative Routes

Trail Management and Components

Alternative 1A: Proposed Action would be located approximately 1.5 miles from the North Piney Creek to Smith's Fork High Potential Route Segment, also known as the Lander Cutoff of the California NHT. Due to the high level of visual screening afforded by Riley Ridge and the level of existing cultural modification adjacent to the Project, there would be minimal effects on the trail's nature and purpose. Impacts associated with the other alternative routes are the same as the impacts of Alternative 1A: Proposed Action. Views of the Proposed Riley Ridge Sweetening Plant would occur from more than 7 miles away and due to this distance, as well as topographic screening opportunities associated with the rolling terrain in this area resulting in no visually apparent modification in the trail's viewshed, no significant impacts are anticipated on the Sublette Cutoff portion of the California NHT.

Scenic and Recreation Resources

Alternative 1A: Proposed Action would introduce additional geometric forms into Class A and Class C landscapes similar to other cultural modifications in the area. Due to the screening of views and lack of historic trail-association recreation resources in the area, the effect of these modifications on the historic trail's setting and characteristics would be minimal. Impacts associated with the other alternative routes are the same as the impacts of Alternative 1A: Proposed Action. Miles of BLM SQRUs crossed by the Project, by alternative, are described in Table 4-58.

Table 4-58
California National Historic Trail Scenic Quality Rating Units for Segment 1

Alternative Route	Total Miles	Scenic Quality Rating Class Crossed (miles)		
		A	B	C
1A: Proposed Action	7.7	2.5	0.0	5.2
1A Variation: Dry Basin Draw	7.7	2.5	0.0	5.2
1B: Dry Piney	7.7	2.5	0.0	5.2
1C: Figure Four	7.7	2.5	0.0	5.2

NOTE: Mileages equal total miles of trail-specific study areas within alternative.

Due to the lack of trail-associated viewers (e.g., viewers using the auto tour route, contributing historic trail segments, and adjacent recreation areas) in the area, there would be no identifiable impacts on these trail-associated viewing locations from the implementation of the Project on alternative routes in Segment 1. Miles of the Project in each Project-level VDZs, from trail-associated viewers, are described in Table 4-59. Note, effects on the trail setting are described in the previous paragraph. No historic trail-associated special designations would be affected in this Project segment.

Table 4-59 California National Historic Trail Viewers for Segment 1						
Alternative Route	**Total Miles**	**Project-Level Distance Zone from Trail-Associated Viewers (miles)**				
		0 to 0.5 mile	**0.5 to 1 mile**	**1 to 2 miles**	**2 to 3 miles**	**3 plus miles**
1A: Proposed Action	7.7	0.0	0.0	0.0	0.0	7.7
1A Variation: Dry Basin Draw	7.7	0.0	0.0	0.0	0.0	7.7
1B: Dry Piney	7.7	0.0	0.0	0.0	0.0	7.7
1C: Figure Four	7.7	0.0	0.0	0.0	0.0	7.7
NOTE: Mileages equal total miles of trail-specific study corridor and not the total length of the alternative.						

Historic and Cultural Resources

Segments of the Lander Cutoff of the California NHT (48SU387) have been documented approximately 1.3 miles northeast of Alternative 1A: Proposed Action, Alternative 1B: Dry Piney, and Alternative 1C: Figure Four (data not available in WYCRO). Traces of the Lander Cutoff of the California NHT follow the northern foothills of Riley Ridge, just north of South Piney Creek in Sublette County. These segments of the trail were evaluated as contributing to the overall NRHP eligibility of the Lander Cutoff of the California NHT. No NHT-specific sites are associated with the Lander Cutoff of the California NHT within 3 miles of this alternative route.

Only one site of historic importance is within the area of analysis of the Lander Cutoff of the California NHT (48SU387). The site, Daniel's Homestead (48SU895), was settled along the Lander Cutoff in the early 1900s. The site contains a small monument dedicated to the birth of an infant along the Emigrant Trail. Daniel's Homestead is more than 2.5 miles north of the alternative route. Based on the site's period of importance, it appears to be unrelated to the trail itself. Additional historic sites along the Lander Trail appear to be unrelated to the trail itself, such as the NRHP-eligible historic Civilian Conservation Corps camp and road.

In the area where Alternative 1A: Proposed Action would be in proximity to sites and segments associated with the California NHT, the historic landscape setting of the trail varies from being highly intact to being partially intact. While some areas along the trail have settings that appear as they would have during the trail's period of importance, others include visual intrusions, such as oil and gas development, or ranching-related structures. There would be no direct impacts on trail-related sites and segments, because Alternative 1A: Proposed Action would not directly cross these sites and segments. In addition, the introduction of the Project would not appreciably modify the historic setting, because the Project components would be visible only from long distances and generally would be screened from view by topography and vegetation.

Biological, Natural, and Other Resources

Like the description for Scenic Resources, Alternative 1A: Proposed Action would introduce additional geometric forms into landscapes adjacent to the historic trail corridor, which would be mostly screened from view.

Impacts associated with the other alternative routes would be the same as the impacts associated with Alternative 1A: Proposed Action.

4.3.7.5.3.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Impacts on the California NHT are similar to the impacts on the Oregon NHT in this Project segment for both Alternative 2A: Proposed Action and Alternative 2B: Southern Route. In addition to proximity to

NHT Class II trail traces, Alternative 2B: Southern Route is located approximately 1 mile from Simpson's Hollow and 3 miles from the Mormon Knolls trail-associated cultural sites, which would experience similar impacts as the NHT Class II trail traces (Refer to Section 4.3.7.5)

Sublette Cutoff

Trail Management and Components

Impacts on the Sublette Cutoff portion of the California NHT would be similar to those described above, but it is important to note that the Sublette Cutoff of the California NHT is also currently under feasibility study to be added to the Oregon NHT. Application of agency-required mitigation measures, including sensitive resource avoidance (Agency-Required Mitigation Measure 1), applying interim or intense reclamation (Agency-Required Mitigation Measure 8), using overland access (Agency-Required Mitigation Measure 5), and minimizing new or improved accessibility (Agency-Required Mitigation Measure 9), would reduce the Project's impacts on the Oregon NHT. The sensitive resource avoidance measure would also include boring under NHT segments for a minimum or 0.25 mile on either side of the NHT and avoiding the siting of construction access routes over contributing trail segments to assure that the Project would be consistent with the BLM Rock Springs RMP. Considering application of these mitigation measures, the Project would not compromise the potential inclusion of this historic trail segment with the Oregon NHT.

Scenic and Recreation Resources

Alternative 2A: Proposed Action would introduce geometric forms into Class C landscapes with limited existing cultural modifications. Through the application of agency-required mitigation, as described above, the Project would begin to blend with existing landscape character. Impacts associated with Alternative 2B: Southern Route are less intense than the impacts of Alternative 2A: Proposed Action due to landform screening reducing the extent of influence the Project would have on the trail setting. Miles of BLM SQRUs crossed by the Project, by alternative, are described in Table 4-60.

Table 4-60
Sublette Cutoff Historic Trail Scenic Quality Rating Units for Segment 2

Alternative Route	Total Miles	Scenic Quality Rating Class Crossed (miles)		
		A	B	C
2A: Proposed Action	7.3	0.0	0.0	7.3
2B: Southern Route	6.6	0.0	0.0	6.6

NOTE: Mileages equal total miles of trail-specific study corridor and not the total length of the alternative.

Impacts on trail-associated viewers (e.g., viewers using historic trail segments and adjacent recreation areas) resulting from Alternative 2A: Proposed Action would be most intense within 0.5 mile of the Project, where the Project would attract attention of viewers. Through intense reclamation efforts, the Project would, over time, begin to blend with landscapes visible from these locations. Trail-associated viewers would view approximately 5.0 miles of the 7.1 miles of the Project within the trail study corridor.

Impacts associated with Alternative 2B: Southern Route are similar to the impacts of Alternative 2A: Proposed Action, except historic trail-associated viewers would view approximately 3.5 miles of the 6.5 miles of the Project within the historic trail visual corridor. Miles of the Project in each Project-level VDZ, from historic trail-associated viewers, are described in Table 4-61.

Table 4-61 Sublette Cutoff Historic Trail Viewers for Segment 2						
Alternative Route	**Total Miles**	**Project-Level Distance Zone from Trail-Associated Viewers (miles)**				
		0 to 0.5 mile	**0.5 to 1 mile**	**1 to 2 miles**	**2 to 3 miles**	**3 plus miles**
2A: Proposed Action	7.3	2.4	2.1	1.6	1.1	0.1
2B: Southern Route	6.6	1.0	1.0	2.0	2.6	0.0
NOTE: Mileages equal total miles of trail-specific study corridor and not the total length of the alternative.						

Historic and Cultural Resources

Alternative 2A: Proposed Action crosses an NHT Class I trail segment and would be visible from 6.7 miles of the 9.3 miles of NHT Class I and II segments in the trail study corridor. Two contributing segments of the Sublette Cutoff of the California NHT are noted along this alternative route. This alternative route crosses one trail segment, while the other would be 1.5 miles to the west-southwest. During the NHT inventory (Rockwell et al. 2012), an additional contributing segment of the Sublette Cutoff of the California NHT was documented (48SW1841_80) and it would be crossed by the alternative route. Segments also recorded during this inventory include a series of trail segments extending northeast and east several hundred feet from Alternative 2A: Proposed Action. Additional contributing segments of the trail were documented by the Wyoming Recreation Commission in the WYCRO data, but these recommendations have not been reviewed by the BLM or the SHPO. Alternative 2A: Proposed Action crosses the Sublette Cutoff of the California NHT in an area that contributes to the NRHP eligibility of the trails.

A variant of the Sublette Cutoff, known as the North Sublette Meadow Springs variant, would also be within 3 miles of this alternative route at NHT crossings. Historically, this variant (48SU7344) led to North Sublette Meadow Spring and then back to Sublette Cutoff. One contributing segment of this trail would be 1,600 feet south of Alternative 2A: Proposed Action.

In addition, records indicate that the Little Sandy Crossing of the Sublette Cutoff of the California NHT site would be approximately 1.5 miles northeast from Alternative 2A: Proposed Action. There are no SHPO data regarding this crossing and it is assumed that it has not been fully recorded or the location ground verified.

A historic cemetery/grave (48SW14861) recommended as eligible for NRHP nomination is also located along Alternative 2A: Proposed Action. This site is in the vicinity of the Little Sandy Crossing and is approximately 1.5 miles northeast of Alternative 2A: Proposed Action. It is unknown if this cemetery is associated with the use of the Sublette Cutoff of the California NHT. No previously identified historic sites of importance were noted along the North Sublette Meadow Springs variant.

In the area where Alternative 2A: Proposed Action crosses the Sublette Cutoff of the California NHT, the historic landscape setting of the trail and trail-related features appears to be generally intact—appearing much as it would have during the trail's period of importance. The only visual intrusions within the historic setting are small unpaved county roads, which do not detract considerably from the historic setting. To avoid direct impacts on the contributing historic trail segments and to assure that the Project would be consistent with the BLM Rock Springs RMP, a sensitive resource avoidance measure would include boring under NHT segments for a minimum or 0.25 mile on either side of the NHT and avoiding the siting of construction access routes over contributing trail segments. The introduction of the Project would modify the historic setting, but through intense reclamation efforts, the Project would begin to blend with the existing setting, thus diminishing its long-term effect on these resources.

Impacts associated with Alternative 2B: Southern Route would be somewhat similar to the impacts of Alternative 2A: Proposed Action, except 5.5 miles of the 10.8 miles of NHT Class I and II segments would have views of the Project. Alternative 2B: Southern Route crosses a segment of the Sublette Cutoff of the California NHT. WYCRO data do not list any evaluated trail segments in this corridor; however, during the NHTs Inventory (Rockwell et al. 2012), a newly recorded segment of the Sublette Cutoff of the California NHT (48SW1841_88) was recommended as contributing and would be crossed by the alternative route (Rockwell et al. 2012). Along the Sublette Cutoff of the California NHT, historic inscriptions (48SW18183) are located more than 2.5 miles east of the centerline for Alternative 2B: Southern Route (Ollie et al. 2016).

Biological, Natural, and Other Resources

Alternative 2A: Proposed Action would modify characteristic landscapes associated with the Sublette Cutoff Historic Trail, including sagebrush and desert scrub landscapes, as well as riparian corridors. Mitigation measures would include minimizing vegetation clearing and intense reclamation efforts to reduce effects on these vegetation communities and associated effects on other historic trail resources.

Impacts associated with Alternative 2B: Southern Route would be the same as those discussed for Alternative 2A: Proposed Action.

4.3.7.5.3.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Impacts on the California NHT are similar to the impacts on the Oregon NHT in this Project segment for both Alternative 3A: Proposed Action and the other alternative routes.

The Sublette Cutoff Historic Trail is not adjacent to Segment 3; therefore, no identifiable impacts on the Sublette Cutoff are anticipated for any of the Segment 3 alternative routes.

4.3.7.5.3.5 230-Kilovolt Transmission Line

The Sublette Cutoff portion of the California NHT is located approximately 6 miles from the proposed 230kV transmission line, with other portions of the California NHT located more than 15 miles away; therefore, no identifiable impacts on the California NHT are anticipated due to this distance and topographic screening opportunities associated with the rolling terrain in this area.

4.3.7.5.3.6 Mainline Valve Distribution Lines

Impacts on the California NHT are similar to the impacts on the Oregon NHT from this Project component (refer to Section 4.3.7.5).

4.3.7.5.4 Pony Express National Historic Trail

A summary of miles of each impact level, by alternative, are described in Table 4-62.

Table 4-62
Pony Express National Historic Trail Residual Impacts

Alternative Route	Total Miles	Residual Impacts (miles)			
		High	Moderate	Low	No Impact
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	30.4	0.0	0.0	0.0	30.4
1A Variation: Dry Basin Draw	30.7	0.0	0.0	0.0	30.7
1B: Dry Piney	34.5	0.0	0.0	0.0	34.5
1C: Figure Four	38.5	0.0	0.0	0.0	38.5

Table 4-62 Pony Express National Historic Trail Residual Impacts					
Alternative Route	**Total Miles**	**Residual Impacts (miles)**			
		High	**Moderate**	**Low**	**No Impact**
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	129.1	0.0	8.2	2.4	112.1
2B: Southern Route	136.2	0.0	2.8	3.8	129.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	83.2	0.0	2.7	7.4	73.1
3B: Lost Creek to Lost Cabin	73.0	0.0	2.7	7.4	62.9
3C: Lost Creek to Highway 20/26	101.4	0.0	2.7	7.4	91.3
NOTE: "No Impact" indicates miles of the Project located outside of the trail-specific study corridor and, therefore, impacts were not identified for these areas.					

4.3.7.5.4.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment will remain as it presently exists.

4.3.7.5.4.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction and Injection Well Sites

No National Trail segments or related resources are located at the proposed Riley Ridge Sweetening Plant or injection well sites. Therefore, no impact on the National Trail System is anticipated.

Segment 1 Pipeline Alternative Routes

The Pony Express NHT is approximately more than 30 miles from Segment 1; therefore, no identifiable impacts on the Pony Express NHT are anticipated for any of the Segment 1 alternative routes.

4.3.7.5.4.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Impacts on the Pony Express NHT are similar to the impacts on the Oregon NHT in this Project segment for both Alternatives 2A: Proposed Action and 2B: Southern Route. In addition to proximity to NHT Class II trail traces, Alternative 2B: Southern Route is located approximately 1 mile from Simpson's Hollow and 3 miles from the Mormon Knolls trail-associated cultural sites, which would experience similar impacts as the NHT Class II trail traces. (Refer to Section 4.3.7.5)

4.3.7.5.4.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Impacts on the Pony Express NHT are similar to the impacts on the Oregon NHT in this Project segment for both Alternative 3A: Proposed Action and the other alternative routes. (Refer to Section 4.3.7.5)

4.3.7.5.4.5 230-Kilovolt Transmission Line

The 230kV transmission line is not within the 3.0-mile viewshed of the Pony Express NHT; therefore, no identifiable impacts on the Pony Express NHT are anticipated.

4.3.7.5.4.6 Mainline Valve Distribution Lines

Impacts on the Pony Express NHT are similar to the impacts on the Oregon NHT from this Project component (refer to Section 4.3.7.5).

4.3.7.5.5 Continental Divide National Scenic Trail

A summary of miles of each impact level, by alternative, are described in Table 4-63.

Table 4-63
Continental Divide National Scenic Trail Residual Impacts

Alternative Route	Total Miles	Residual Impacts (miles)			
		High	Moderate	Low	No Impact
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	30.4	0.0	0.0	0.0	30.4
1A Variation: Dry Basin Draw	30.7	0.0	0.0	0.0	30.7
1B: Dry Piney	34.5	0.0	0.0	0.0	34.5
1C: Figure Four	38.5	0.0	0.0	0.0	38.5
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	129.1	0.0	2.0	4.1	123.0
2B: Southern Route	136.2	0.0	2.0	4.1	130.1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	83.2	0.0	0.0	3.2	80.0
3B: Lost Creek to Lost Cabin	73.0	0.0	0.0	3.2	69.8
3C: Lost Creek to Highway 20/26	101.4	0.0	0.0	3.2	98.2

NOTE: "No Impact" indicates miles of the Project located outside of the trail-specific study corridor and, therefore, impacts were not identified for these areas.

4.3.7.5.5.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment will remain as it presently exists.

4.3.7.5.5.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction and Injection Well Sites

No National Trail segments or related resources are located at the proposed Riley Ridge Sweetening Plant or injection well sites. Therefore, no impact on the National Trail System is anticipated.

Segment 1 Pipeline Alternative Routes

The CDNST is not adjacent to alternative routes considered in Segment 1 therefore; no identifiable impacts on the CDNST are anticipated for any of the Segment 1 alternative routes.

4.3.7.5.5.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Trail Management and Components

The addition of Alternative 2A: Proposed Action in proximity to the CDNST would marginally influence the scenic NST's nature and purpose. This is due to the presence of existing pipelines, a 230kV transmission line, and mining operations, which have altered the natural setting in the scenic NST's

viewshed. These effects would be further reduced after application of Agency-Required Mitigation Measure 1 to bore the Project under the scenic NST as required in the BLM Lander RMP. Impacts associated with Alternative 2B: Southern Route would be the same as the impacts for Alternative 2A: Proposed Action.

Scenic and Recreation Resources

Alternative 2A: Proposed Action would introduce geometric forms into Class B and C landscapes with existing linear utility development. Due to the extent of existing cultural modifications, the Project would introduce elements similar to the existing pipelines traversing these landscapes. Impacts associated with Alternative 2B: Southern Route would be the same as the impacts for Alternative 2A: Proposed Action. Miles of BLM SQRUs crossed by the Project, by alternative route, are described in Table 4-64.

Table 4-64
Continental Divide National Scenic Trail Scenic Quality Rating Units for Segment 2

Alternative Route	Total Miles	Scenic Quality Rating Class Crossed (miles)		
		A	B	C
2A: Proposed Action	6.1	0.0	1.3	4.8
2B: Southern Route	6.1	0.0	1.3	4.8
NOTE: Mileages equal total miles of trail-specific study corridor and not the total length of the alternative.				

Impacts on NST-associated viewers (e.g., NST alignment and adjacent recreation areas) resulting from Alternative 2A: Proposed Action would be most intense within 0.5 mile of the Project, where additional geometric forms are introduced into the viewshed, similar to existing line utility development. These NST-associated viewers would view approximately 4.5 miles of the 6.1 miles of the Project within the NST study corridor. These effects would occur within the CDNST SRMA and ERMA. Impacts associated with Alternative 2B: Southern Route would be the same as the impacts discussed for Alternative 2A: Proposed Action. Miles of the Project in each Project-level VDZ, from scenic NST-associated viewers, are described in Table 4-65.

Table 4-65
Continental Divide National Scenic Trail Viewers for Segment 2

Alternative Route	Total Miles	Project-Level Distance Zone from Trail-Associated Viewers (miles)				
		0 to 0.5 mile	0.5 to 1 mile	1 to 2 miles	2 to 3 miles	3 plus miles
2A: Proposed Action	6.1	1.2	1.1	2.6	1.1	0.1
2B: Southern Route	6.1	1.2	1.1	2.6	1.1	0.1
NOTE: Mileages equal total miles of trail-specific study corridor and not the total length of the alternative.						

Historic and Cultural Resources

No historic trail-related cultural or historic resources are in the Project's study area associated with the CDNST.

Biological, Natural, and Other Resources

Alternative 2A: Proposed Action would further modify landscapes adjacent to the CDNST, including sagebrush and desert scrub landscapes, as well as riparian corridors (e.g., Crooks Creek). These modifications would be similar to those associated with existing linear utility development in the area. Impacts associated with Alternative 2B: Southern Route would be the same as the impacts for Alternative 2A: Proposed Action.

4.3.7.5.5.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Impacts on the CDNST for Segment 3 are similar to the impacts for Segment 2 since the NST is located at the intersection of these Project segments. For consistency, the miles of SQRUs (Table 4-66) and VDZs from NST-associated viewers are reported for this segment (Table 4-67).

Table 4-66
Continental Divide National Scenic Trail Scenic Quality Rating Units for Segment 3

Alternative Route	Total Miles	Scenic Quality Rating Class Crossed (miles)		
		A	B	C
3A: Proposed Action	3.2	0.0	0.0	3.2
3B: Lost Creek to Lost Cabin	3.2	0.0	0.0	3.2
3C: Lost Creek to Highway 20/26	3.2	0.0	0.0	3.2

NOTE: Mileages equal total miles of trail-specific study corridor and not the total length of the alternative.

Table 4-67
Continental Divide National Scenic Trail Viewers for Segment 3

Alternative Route	Total Miles	Project-Level Distance Zone from Trail-Associated Viewers (miles)				
		0 to 0.5 mile	0.5 to 1 mile	1 to 2 miles	2 to 3 miles	3 plus miles
3A: Proposed Action	3.2	0.0	0.0	1.9	1.3	0.0
3B: Lost Creek to Lost Cabin	3.2	0.0	0.0	1.9	1.3	0.0
3C: Lost Creek to Highway 20/26	3.2	0.0	0.0	1.9	1.3	0.0

NOTE: Mileages equal total miles of trail-specific study corridor and not the total length of the alternative.

4.3.7.5.5.5 230-Kilovolt Transmission Line

The CDNST is not adjacent to the proposed 230kV transmission line; therefore, no identifiable impacts on the CDNST are anticipated.

4.3.7.5.5.6 Mainline Valve Distribution Lines

The introduction of distribution power lines to serve MLVs would include vertical poles, right-of-way vegetation clearing, and access roads, which would be similar but smaller in scale compared to the existing transmission line crossing the NST in this area. Based on direction in the BLM Lander RMP and to reduce impacts on the CDNST, the distribution line could be buried or power could be generated via solar power at the MLV itself. The burial of the line would still introduce a narrow geometrically cleared right-of-way, smaller in scale than the Project, but would reduce visual contrast by removing the vertical element proposed.

4.3.7.6 Summary Comparison of Alternative Routes

4.3.7.6.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Impacts on the California NHT, the only NHT in proximity to Segment 1, are the same for all three alternative routes and one route variation in Segment 1 since they share the same alignment in the associated NHT study corridor. Due to the visual topographic screening in this area and existing cultural modifications, the effects on the California NHT would be minimal in Segment 1 after application of agency-approved mitigation measures.

4.3.7.6.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Impacts resulting from Alternative 2A: Proposed Action on the California, Oregon, Pony Express, and Mormon Pioneer NHTs would occur in a larger geographic area than Alternative 2B: Southern Alternative due to the separation the South Pass High Potential Route Segment and Auto Tour Route resulting in 8.2 miles of moderate impacts and 2.8 miles respectively. Additionally, due to topographic screening opportunities where the Project would cross these NHTs on Alternative 2B: Southern Route, fewer miles of the Auto Tour Route and NHT Class I and II trail segments would have views of the Project than Alternative 2A: Proposed Action.

Impacts on the Sublette Cutoff portion of the California NHT, a segment also under study to be added to the Oregon NHT, are more widespread on Alternative 2A: Proposed Action than Alternative 2B: Southern Alternative due to the rolling terrain screening views from the NHT along Alternative 2B, resulting in 5.6 miles and 2.5 miles of moderate impacts respectively. Regarding visibility from NHT Class I and II trail segments, Alternative 2A: Proposed Action would be visible from 6.7 miles of these traces, whereas Alternative 2B: Southern Route would be visible from 5.5 miles.

Impacts on the CDNST are the same for both Alternative 2A: Proposed Action and Alternative 2B: Southern Route, 2.0 miles of moderate impacts, as they share the same alignment where the NHT is crossed south of Jeffry City in proximity to existing pipelines, a 230kV transmission line, and mining operations.

4.3.7.6.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

All three alternative routes in Segment 3 cross the South Pass High Potential Route Segment and Auto Tour Route, associated with the California, Oregon, Pony Express, and Mormon Pioneer NHTs, in the same location in proximity to Jeffrey City. Due to the existing modifications in this area, including pipelines, a 230kV transmission line, and development adjacent to Jeffrey City, the impacts on the NHT's nature and purpose from the Project would be minimal after application of agency-approved mitigation measures.

Impacts on the CDNST, resulting from each of the three alternative routes in Segment 3, would be the same, as they share the same alignment where the NHT is crossed near the node between Segments 2 and 3 of the Project.

4.3.8 Native American Concerns

4.3.8.1 Issues Identified for Analysis

Based on the results of preliminary research (literature search) and coordination/consultation with the Native American tribes potentially affected by the Project, Native American concerns focus on the following issues:

- the NEPA process and how cultural resources will be addressed
- the level of planning and participation involved in the Project and the role of the tribes
- the tribal consultation process and the logistics of in-person consultation meetings and field visits
- the Programmatic Agreement document
- Cultural resources data gathering and information sharing between the BLM and tribes
- Cultural resources site visits and TCP inventories

- Direct and indirect effects on cultural resources that are relevant to the tribes, including designated and potential TCPs, cultural landscapes (e.g., mountains, ridges, springs, rivers, streams, and rock shelters), and human burial sites
- Tribal monitoring during data recovery and Project implementation
- Cultural resources contractor selection for the Project
- Cumulative effects of pipeline projects across the state of Wyoming
- Mitigation
- Confidentiality
- Human remains and repatriation
- Public health and safety issues
- Concern about pipeline leakage or breakage and spills of CO_2 and H_2S gas into the Green River in the area where the pipeline crosses the river
- Effects on greater sage-grouse and other wildlife and their habitats
- Plant-gathering areas and hunting locations

A field visit of the Project area was held from September 28 to October 1, 2015, to provide tribal representatives with an overview of the location of the alternative routes, resources, and Project area. General concerns expressed by the tribes during the field visit are listed below:

- Effects on places of Native American concern (Boars Tusk and Chimney Butte landscapes)
- Effects on TCPs from Project construction, operation, and maintenance
- Disruption of human burial sites
- Need for tribal inventories
- Tribal involvement in monitoring the construction of the pipeline and assisting in the identification of any discovery
- Site confidentiality

Table 4-68 lists the Native American tribes that have been contacted and summarizes the review process and cultural resources concerns they have raised to date. For further information regarding the results of the consultation efforts to date, refer to Section 5.2.2.3.

Table 4-68
List of Native American Tribes and Summary of Concerns

State	Tribe	Summary of Issues Raised during Initial Coordination/Consultation
Idaho	Shoshone-Bannock Tribes of the Fort Hall Reservation	The proximity of the Project to the Boars Tusk is a concern for the tribes (issues over public access and recreational use [e.g., climbing]); tribal members noted the importance of the entire Boars Tusk landscape as a spiritual place. The tribes are concerned about the safety of H_2S and CO_2 and the potential for leaks. They have expressed concern about other tribes commenting on the Project in areas where those tribes have no ancestral ties. The tribes have also expressed concern about confidentiality of human burial sites.
Montana	Crow Tribe	The tribe has expressed concern regarding pipeline safety and the colocation of pipelines and utility corridors (generally, concerns about the proliferation of pipelines in Wyoming).
Montana	Fort Peck Assiniboine and Sioux Tribes	No comments have been received to date.

Table 4-68
List of Native American Tribes and Summary of Concerns

State	Tribe	Summary of Issues Raised during Initial Coordination/Consultation
Montana	Northern Cheyenne Tribe	The tribe has expressed concerned about cumulative effects and colocation of pipelines across Wyoming and public safety (generally, concerns about the proliferation of pipelines in Wyoming). They are interested in the other studies that have been completed for the Project including wildlife. The tribe would like to complete a TCP study for each of the proposed alternative routes to ensure adequate review of all resources before a preferred alternative route is selected.
North Dakota	Standing Rock Sioux Tribe	The tribe has not confirmed interest in consulting party status nor attended any of the scheduled meetings related to the Project. Consultation with the tribe will continue with further Project correspondence, unless the tribe declines consulting party status.
Oklahoma	Comanche Nation of Oklahoma	The tribe has confirmed interest in consulting party status; however, the tribe has not attended any of the scheduled meetings related to the Project. No comments have been received to date.
South Dakota	Cheyenne River Sioux Tribe	The tribe has expressed concern regarding colocation of pipelines and utility corridors and the risk of encroaching on sites of tribal importance (generally, concerns about the proliferation of pipelines in Wyoming); and public safety. The tribe stated avoidance of sites is preferred over mitigation. The tribe is interested in participating in the inventory and identification phase of the Project. They would like to provide their own reports that would identify sites of tribal importance and/or TCPs in the Project area. The tribe has also expressed concern about Chimney Butte landscape.
South Dakota	Crow Creek Sioux Tribe	The tribe has expressed concern about Chimney Butte landscape.
South Dakota	Oglala Sioux Tribe	The tribe has confirmed interest in consulting party status; however, the tribe has not attended any of the scheduled meetings related to the Project. No comments have been received to date.
South Dakota	Rosebud Sioux Tribe	The tribe has expressed concern about Chimney Butte landscape.
South Dakota	Sisseton-Wahpeton Oyate Tribes	The tribes have declined consulting party status under the NHPA but would like to continue to receive information gathered during the NEPA process.
South Dakota	Yankton Sioux Tribe	The tribe would like to complete a TCP study for each of the proposed alternative routes. The tribe would like to participate in all phases of the Project including inventory, evaluation, and mitigation. They are concerned about data sharing between the BLM and the tribes, and wish to receive completed resource inventory reports. Concerns were raised about why all alternative routes are not being inventoried. The tribe is also concerned with the destruction of sites and would like access to the Project area to visit any sites that will be damaged.

Table 4-68
List of Native American Tribes and Summary of Concerns

State	Tribe	Summary of Issues Raised during Initial Coordination/Consultation
Utah	The Ute Indian Tribe of the Uintah and Ouray Reservation	The tribe has urged the BLM to make it as easy as possible for tribes to participate (e.g., coordination, logistics, and timely reimbursement for travel costs). The tribe stated they would like to visit the sites identified after the Class III inventory is completed for the Project. They requested tribal monitoring for the Project during data recovery and/or construction. The proximity of the Project to the Boars Tusk is of great concern to the tribe. The Boars Tusk and its surroundings are considered to be a sacred landscape by the tribe.
Wyoming	Eastern Shoshone Tribe of the Wind River Reservation	The tribe has expressed concern regarding artifact removal and subsequent curation. The tribe has requested that artifacts be left on the landscape or returned to the landscape rather than curated in a repository. They are interested in providing monitors for the Project and would like to visit select sites of importance currently known and identified during Class III surveys. The tribe has indicated concerns with wildlife and sage-grouse habitats as well as areas for gathering medicinal plants. Additional concerns include: repatriation, TCP inventories, and potential effects on the Boars Tusk. The Boars Tusk and its surroundings are considered to be a sacred landscape by the tribe. The proximity of the Project to the Boars Tusk is of great concern to them. The tribe stressed sharing knowledge concerning plant-gathering locations and hunting areas. The tribe has also expressed concern about the pipeline crossing the Green River. The tribe is concerned about pipeline leakage or breakage and spills of CO_2 and H_2S gas into the Green River. It has been suggested that the pipeline be constructed above ground (especially at river crossing) as it would be more easily accessed should problems arise. However, the tribe has noted there would be visual impacts, the potential for vandalism, maintenance issues due to high winds, and greater surface disturbance if the pipeline crossing was above ground at the river crossing. The tribe is concerned about pipeline crossings of any flowing water, including rivers, creeks, streams, and underground aquifers. The tribe expressed concerns about rock art and other sites in the vicinity of rock art. The tribe would like to assume the status of lead tribe on the Project since the Project is located within the Eastern Shoshone homeland. The tribe requested information about railroads crossed by the Project. The tribe requested information about design and engineering aspects of the pipeline the Applicant would use for public safety, including information concerning the prevention of pipeline issues due to freeze/thaw and geologic faults. The tribe has asked who would benefit from the pipeline, and whether the EPA will be commenting on the Project.

Table 4-68 List of Native American Tribes and Summary of Concerns		
State	**Tribe**	**Summary of Issues Raised during Initial Coordination/Consultation**
Wyoming	Northern Arapaho Tribe of the Wind River Reservation	The tribe is interested in providing monitors for the Project and would like to visit selected sites of importance currently known and identified during Class III surveys. The tribe has concerns regarding wildlife (crucial winter range, migration corridors, and sage-grouse habitat), public health, and public safety (safety of H_2S and the risk of leaks). Additional concerns include: cumulative effects, TCP inventories, and potential effects on the Boars Tusk (the Boars Tusk is a very significant natural landmark to the Northern Arapaho Tribe of the Wind River Reservation). The tribe considers that cultural sites of importance to the tribe may not be the same as those identified by SHPO as significant. The tribe has also expressed concern about confidentiality of human burial sites.

Native American tribes raised issues about potential effects on cultural resources, including historic properties (especially those located along the Big Sandy Foothills and the Jack Morrow Hills), that are and may be of interest to the tribes, and TCPs. Resources considered of importance include stone circles/rock alignments, rock shelters, rock cairns, medicine wheels, rock art, human burial sites, trails, and cultural landscapes.

Specifically, tribes have expressed concern over the following cultural resources: Project proximity to the Boars Tusk, the Chimney Butte landscape, and the Cedar Ridge TCP and associated sites. Although the tribes have not expressed concern about impact on the NRHP-listed Arapahoe and Lost Creek site, the Greater Sand Dunes ACEC, the West Sand Dunes Archaeological District, and NHTs, concerns could arise. There is a high probability of finding significant prehistoric sites in the West Sand Dunes Archaeological District and throughout the Project area.

The previously mentioned cultural resources do not represent a complete list of sites or areas important to the tribes. Ongoing coordination and consultation with tribes may identify additional resources of concern. As part of this cultural assessment, the following sections address solely the known cultural resources of potential tribal importance in the Project study area.

Data on known cultural resources of potential importance to tribes were used to describe the affected environment for all alternative routes and route variations (refer to Ollie et al. 2016). The scope of the indirect and direct effects APE for Native American concerns is the same as that described in Section 4.3.2.2. The study methodology includes a review of cultural resources site data, TCPs, ACECs with cultural components, tribal correspondence, communication records, and tribal meeting notes that address potential Native American concerns in or adjacent to the Project study area. For further information regarding ACECs, refer to Section 4.3.16.

4.3.8.2 Types of Potential Effects

The construction, operation, and maintenance of the Project could result in both direct and indirect adverse effects on locations and resources of Native American concern. Potential effects on resources of Native American concern, including potential TCPs and other properties of traditional or spiritual importance to tribes, are similar to those outlined in Section 4.3.2.2 for all cultural resources. Potential effects would be discussed in government-to-government consultation between the BLM and the appropriate Native American tribe on a case-by-case basis. Additionally, ongoing tribal consultation, in accordance with the NHPA, NAGRPA, and other relevant federal legislation and policies would help

determine other issues of concern and appropriate mitigation measures. Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual effects.

4.3.8.3 Criteria for Assessing Impacts

Criteria were developed to assess potential effects on locations and resources associated with the implementation of the Project. Criteria developed to assess potential effects on cultural resources were based on the presence/absence of significant cultural resources (e.g., historic properties and properties of traditional or spiritual importance to tribes) that could be encountered along each alternative pipeline route; the nature of potential effects on cultural resources of Native American concern ; and the overall density of resources for each of the alternative routes and route variations as identified from the literature search or through Native American consultation.

4.3.8.4 Mitigation Planning

Specific mitigation measures on locations and resources of Native American concern would be developed by the BLM in consultation with the appropriate Native American tribe and would be implemented to mitigate any identified adverse effects. These may include Project modifications to avoid, minimize, and mitigate any identified adverse effects.

Prior to initiation of construction, a Class III cultural resources inventory will be completed for the selected route in compliance with the requirements of Section 106 of the NHPA as detailed in the Programmatic Agreement for the Project. On completion of the Class III inventory, further tribal consultation and site visits regarding micro-siting of the route will be conducted to avoid and minimize impacts on locations and resources of tribal concern to the extent possible. HPTPs will be developed in consultation with the tribes to address any remaining adverse effects resulting from the Project.

Direct impacts on historic properties and properties of traditional or spiritual importance to tribes can be effectively reduced and, in some instances, eliminated through Project design changes. Avoidance is the preferred method to eliminate or reduce adverse effects on historic properties and properties of traditional or spiritual importance to tribes. However, if avoidance and minimization efforts do not completely avoid adverse effects, the BLM, in consultation with the affected tribe(s), will ensure that an HPTP is developed and implemented to mitigate Project-related effects on historic properties and properties of traditional or spiritual importance to tribes. The HPTP will be developed as part of the Programmatic Agreement. Multiple HPTPs may be developed and implemented individually to reflect the segmentation of the Project. Design features and mitigation measures for historic properties and properties of traditional or spiritual importance to tribes are listed in Table 2-18 and Table 4-2 and include:

- **Design Feature 16 (cultural resources). A**pplied to avoid adverse effects or provide for mitigation of historic properties and properties of traditional or spiritual importance to tribes, per mitigation measures required by the Programmatic Agreement.
- **Design Feature 17 (cultural and paleontological resources). A**pplied if an unexpected discovery is encountered.
- **Agency-Required Mitigation Measure 1 (sensitive resource avoidance). A**pplied to avoid adverse effects on historic properties and properties of traditional or spiritual importance to tribes.
- **Agency-Required Mitigation Measure 8 (interim and intense reclamation). A**pplied to rectify the effects of construction and reduce and eliminate effects over time.
- **Agency-Required Mitigation Measure 9 (minimize new or improved accessibility).** Implemented to limit access to areas and prevent potential vandalism of historic properties and properties of traditional or spiritual importance to tribes.

If avoidance of historic properties and properties of traditional or spiritual importance to tribes, is not possible, other efforts would be necessary. Indirect adverse effects would need to be resolved through mitigation efforts as well.

4.3.8.5 Results (Direct and Indirect Effects)

The results of preliminary research (literature search) and coordination/consultation with the tribes potentially affected by the Project are discussed in this section. A limited and differing percentage of previous cultural resources inventory has been conducted along each of the various alternative routes (Table 4-69). For the purpose of comparison of alternative routes, numbers of potential additional sites of tribal concern have been projected for each alternative route. Site projections were calculated based on the average number of sites of potential tribal importance per 100 acres (site density) for those areas that have been previously inventoried within each 1-mile-wide corridor (Ollie et al. 2016). In addition, the projected number of sites of potential tribal importance within the direct effects APE was assessed by using the percentage of areas unsurveyed within each direct effects APE and applying the estimated site density to those areas and adding these findings to the known site totals (Ollie et al. 2016). These projections were calculated for the purpose of comparison of alternative routes only and are not necessarily representative of all sites of potential tribal importance that may, or may not, be present in the Project study area. Site projections are listed in Table 4-69.

As discussed in Section 4.3.8.2, tribes are concerned about potential direct and indirect effects from the Project on cultural resources (including TCPs), human remains, cultural landscapes, plant-gathering locations and hunting areas, and natural resources (e.g., greater sage-grouse and other wildlife and their habitats, ethnobotanical resources, water). Some tribes are particularly concerned with the proximity of the Project to the Cedar Ridge TCP, cultural resources related to the Cedar Ridge TCP, and the Chimney Butte and Boars Tusk landscapes. Also of importance to Native American tribes are archaeological sites, such as stone circles/rock alignments, rock cairns, lodges, rock art, and human burial sites. Some tribes also have expressed concern about the cumulative effects of pipeline projects on natural and cultural resources of tribal importance across the state of Wyoming. Tribal concerns also are associated with the process of environmental review and the role of the tribes in that process. Specifically, concerns relate to the NEPA process and how cultural resources (including TCPs) will be addressed, the level of planning and participation involved in the Project and the role of the tribes, the tribal consultation process and the logistics of in-person consultation meetings and field visits, the Programmatic Agreement document, cultural resources contractor selection for the Project, cultural resources data gathering and information sharing between the BLM and the tribes, visual effects of the Project, and public health and safety issues. Additional concerns include confidentiality, the treatment of human burial sites and human remains, increased accessibility to areas of tribal importance by others, tribal monitoring and assistance in the identification of any discovery, mitigation, and concerns about the proliferation of pipelines in Wyoming.

Tribal input also has indicated the tribes are interested in providing their own reports that would identify sites of tribal importance and in participating in cultural resources site visits and TCP inventories. They believe that TCP inventories need to be conducted for each proposed alternative route to ensure adequate review of all resources before a preferred alternative route is selected. Concerns also have been raised that all alternative routes are not being inventoried. The possibility that other tribes may comment on the Project, in areas where those tribes have no ancestral ties, is of concern to the tribes. In addition, tribes have expressed concern about boring under the Green River (pipeline leakage or breakage and spills of CO_2 and H_2S gas into the river) and about the protection of other water sources in the Project area. Tribes have also expressed concern about the safety of the pipeline in general, as well as the design and engineering elements that will be employed by the Applicant to ensure pipeline safety. Refer to Section 4.3.8.2, Table 4-68, for a list of the tribes that have been contacted and the concerns they have raised to date.

Table 4-69
Summary of Known and Projected Cultural Sites of Potential Tribal Concern

Alternative Route	Known Sites		Site Projections[1]	
	Number of Sites	Number of Sites (Direct Effects APE)	Number of Projected Sites	Projected Sites (Direct Effects APE)[2]
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant				
1A: Proposed Action	5	0	17	0[4]
1AP Variation: Dry Basin Draw Proposed Action[3]	2	0	2	0[4]
1AV Variation: Dry Basin Draw Variation[3]	1	0	2	0[4]
1B: Dry Piney	10	0	20	0[4]
1C: Figure Four	21	2	27	2
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect				
2A: Proposed Action	3	0	48	0[4]
2B: Southern Route	6	1	79	2
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect				
3A: Proposed Action	26	4	136	6
3B: Lost Creek to Lost Cabin	24	3	89	4
3C: Lost Creek to Highway 20/26	16	2	67	3

NOTES:
[1]Site projections were calculated based on the average number of sites per 100 acres (site density) for those areas that have been previously inventoried within each 1-mile-wide corridor (Ollie et al. 2016).
[2]The projected number of sites in the direct effects APE can be assessed by using the percentage of areas unsurveyed in the direct effects APE and applying the estimated site density to those areas and adding these findings to the known site totals.
[3]As per cultural analysis presented in Ollie et al. 2016.
[4]Note that while no sites of Native American concern are projected based on current information, sites of tribal importance may be found once Class III inventories are conducted.

4.3.8.5.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment will remain as it presently exists.

4.3.8.5.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

4.3.8.5.2.1 Riley Ridge Sweetening Plant Construction and Injection Wells

Intensive cultural resources surveys have been completed on 5.4 percent (63.5 acres) of the Riley Ridge Sweetening Plant. The 0.5-mile buffer area for the Riley Ridge Sweetening Plant covers 1,1671 acres. No sites of potential tribal importance have been recorded in the area of the Riley Ridge Sweetening Plant and injection wells. In addition, no key resources have been identified to date by the tribes.

Continued consultation with Native American tribes and/or other interested parties potentially may identify resources of concern.

4.3.8.5.2.2 Segment 1 Pipeline Alternative Routes

Alternative 1A: Proposed Action

Intensive cultural resources surveys have been completed on 30 percent (5,937 acres) of Alternative 1A: Proposed Action. Five sites of potential tribal importance have been recorded (Table 4-69). There are no known sites of potential tribal importance in the direct effects APE. Only 45 percent of the direct effects APE corridor has been inventoried for cultural resources.

Over the entire length of Alternative 1A: Proposed Action, there is the potential for direct and/or indirect effects on an estimated 17 sites of potential tribal importance (Table 4-69). A Class III cultural resource inventory will be required prior to construction in accordance with the Programmatic Agreement for the Project. Site-specific avoidance and minimization measures will be instituted, and HPTPs will be developed and implemented, in consultation with the tribes, for any remaining adverse effects.

The Chimney Butte landscape is also a significant resource identified in proximity to Alternative 1A: Proposed Action. Chimney Butte is located approximately 0.3 mile to the northeast of the alternative route, in the indirect effects APE. Although no archaeological resources have been documented within the boundaries of this prominent landform, this resource is culturally important to several tribes, including the Crow Creek Sioux Tribe, the Cheyenne River Sioux Tribe, and the Rosebud Sioux Tribe. The tribes stated that tribal inventory of key landscapes, such as Chimney Butte, would take into account the viewshed and sacredness of the feature.

The Eastern Shoshone Tribe of the Wind River Reservation expressed concern about Alternative 1A: Proposed Action crossing the Green River. The tribe has concerns about boring under the river (pipeline leakage or breakage and spills of CO_2 and H_2S gas into the river). It has been suggested the pipeline be constructed above ground (especially at river crossings) as it would be more easily accessed should problems arise. However, the tribe has noted that there would be visual impacts, the potential for vandalism, maintenance issues due to high winds, and greater surface disturbance if the pipeline crossing was above ground at the river crossing.

Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbances could damage or destroy these resources if not mitigated.

Alternative 1A Variations (Dry Basin Draw Proposed Action [1AP] and Dry Basin Draw Variation [1AV])

Intensive cultural resources surveys have been completed on 96 percent (2,072 acres) of Alternative 1AP Variation: Dry Basin Draw Proposed Action. Two sites of potential tribal importance have been recorded (Table 4-69). No sites of tribal concern are projected to be present in the direct effects APE. In contrast, 88 percent (2,034 acres) of Alternative 1AV Variation: Dry Basin Draw Variation has been inventoried for cultural resources. Only one site of potential tribal importance previously has been recorded. A Class III cultural resources inventory will be required prior to construction in accordance with the Programmatic Agreement for the Project. Site-specific avoidance and minimization measures will be

instituted, and HPTPs will be developed and implemented, in consultation with the tribes, for any remaining adverse effects.

Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbance could damage or destroy these resources if not mitigated.

Alternative 1B: Dry Piney

Intensive cultural resources surveys have been completed on 49 percent (11,039 acres) of Alternative 1B: Dry Piney. Ten sites of potential tribal importance have been recorded (Table 4-69). There are no known sites of potential tribal importance in the direct effects APE. Only 41 percent of the direct effects APE corridor has been inventoried for cultural resources.

Over the entire length of Alternative 1B: Dry Piney, there is the potential for direct and/or indirect effects on an estimated 20 sites of potential tribal importance (Table 4-69). A Class III cultural resources inventory will be required prior to construction in accordance with the Programmatic Agreement for the Project. Site-specific avoidance and minimization measures will be instituted, and HPTPs will be developed and implemented, in consultation with the tribes, for any remaining adverse effects.

The Eastern Shoshone Tribe of the Wind River Reservation expressed concern about Alternative 1A: Proposed Action crossing the Green River. The tribe has concerns about boring under the river (pipeline leakage or breakage and spills of CO_2 and H_2S gas into the river). It has been suggested the pipeline be constructed above ground (especially at river crossings) as it would be more easily accessed should problems arise. However, the tribe has noted that there would be visual impacts, the potential for vandalism, maintenance issues due to high winds, and greater surface disturbance if the pipeline crossing was above ground at the river crossing.

Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbance could damage or destroy these resources if not mitigated.

Alternative 1C: Figure Four

Intensive cultural resources surveys have been completed on 77 percent (19,049 acres) of Alternative 1C: Figure Four. Twenty-one sites of potential tribal importance have been recorded (Table 4-69). Of the 21

known sites, 2 are in the direct effects APE. Only 63 percent of the direct effects APE corridor has been inventoried for cultural resources.

Over the entire length of Alternative 1C: Figure Four, there is the potential for direct and/or indirect effects on an estimated 27 sites of potential tribal importance (Table 4-69). Of these sites, an estimated two sites would be subject to direct effects from the Project. Prior to construction, a Class III cultural resources inventory will be required in accordance with the Programmatic Agreement for the Project. Site-specific avoidance and minimization measures will be instituted, and HPTPs will be developed and implemented, in consultation with the tribes, for any remaining adverse effects.

The Eastern Shoshone Tribe of the Wind River Reservation expressed concern about Alternative 1A: Proposed Action crossing the Green River. The tribe has concerns about boring under the river (pipeline leakage or breakage and spills of CO_2 and H_2S gas into the river). It has been suggested the pipeline be constructed above ground (especially at river crossings) as it would be more easily accessed should problems arise. However, the tribe has noted that there would be visual impacts, the potential for vandalism, maintenance issues due to high winds, and greater surface disturbance if the pipeline crossing was above ground at the river crossing.

Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbance could damage or destroy these resources if not mitigated.

4.3.8.5.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Alternative 2A: Proposed Action

Intensive cultural resources surveys have been completed on 6 percent (5,160 acres) of Alternative 2A: Proposed Action. Three sites of potential tribal concern have been recorded (Table 4-69). There are no known sites of potential tribal importance in the direct effects APE. Only 23 percent of the direct effects APE corridor has been inventoried for cultural resources.

Over the entire length of Alternative 2A: Proposed Action, there is the potential for direct and/or indirect effects on an estimated 48 sites of potential tribal importance (Table 4-69). No sites of tribal concern are projected to be present in the direct effects APE. Prior to construction, a Class III cultural resources inventory will be required in accordance with the Programmatic Agreement for the Project. Site-specific avoidance and minimization measures will be instituted, and HPTPs will be developed and implemented, in consultation with the tribes, for any remaining adverse effects.

The Arapahoe and Lost Creek Site (48SW4882) also is a significant cultural resource identified along this alternative route. Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated

ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbances could damage or destroy these resources if not mitigated.

Alternative 2B: Southern Route

Intensive cultural resources surveys have been completed on approximately 8 percent (6,647 acres) of Alternative 2B: Southern Route (Table 4-68). Five sites of potential tribal importance and one location (Boars Tusk) of tribal concern have been recorded (Table 4-69). Of the six known sites, one is in the direct effects APE. The Boars Tusk is in the indirect effects APE. Only 17 percent of the direct effects APE corridor has been inventoried for cultural resources.

Over the entire length of Alternative 2B: Southern Route, there is the potential for direct and/or indirect effects on an estimated 79 sites of potential tribal importance (Table 4-69). Of these, two estimated sites would be subject to direct effects from the Project. A Class III cultural resource inventory will be required prior to construction in accordance with the Programmatic Agreement for the Project. Site-specific avoidance and minimization measures will be instituted, and HPTPs will be developed and implemented, in consultation with the tribes, for any remaining adverse effects.

The Boars Tusk is considered a significant resource of tribal concern to the Shoshone-Bannock Tribes of the Fort Hall Reservation, the Ute Indian Tribe of the Uintah and Ouray Reservation, the Eastern Shoshone Tribe of the Wind River Reservation, and the Northern Arapaho Tribe of the Wind River Reservation (Table 4-68). The Boars Tusk could be adversely affected by altering its surrounding sacred landscape, temporarily increasing human access during construction, and introducing audible (during construction) and long-term visual elements that are not characteristic of the area. Adverse effects on this resource, resulting from existing public access, recreational activities (e.g., climbing), and possible vandalism are already occurring in the area and would continue at existing levels. Micro-siting may not be an appropriate action because the surrounding landscape is of importance to the tribes; however, the tribes would be consulted regarding micro-siting options. Alternative 2B: Southern Route would be in conflict with Native American concerns. Refer to Section 4.3.16 for a detailed discussion of potential impacts on this resource and mitigation measures applied.

The Arapahoe and Lost Creek Site (48SW4882), the West Sand Dunes Archaeological District, and the Greater Sand Dunes ACEC also are significant cultural resources identified along this alternative route.

Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbance could damage or destroy these resources if not mitigated.

4.3.8.5.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Alternative 3A: Proposed Action

Intensive cultural resources surveys have been completed on 19 percent (10,247 acres) of Alternative 3A: Proposed Action. Twenty-six sites of potential tribal importance have been recorded (Table 4-69). Of the 26 known sites, 4 are in the direct effects APE. Only 27 percent of the direct effects APE corridor has been inventoried for cultural resources.

Over the entire length of Alternative 3A: Proposed Action, there is the potential for direct and/or indirect effects on an estimated 136 sites of potential tribal importance (Table 4-69). Of these, an estimated six sites would be subject to direct effects from the Project. Prior to construction, a Class III cultural resources inventory will be required in accordance with the Programmatic Agreement for the Project. Site-specific avoidance and minimization measures will be instituted, and HPTPs will be developed and implemented, in consultation with the tribes, for any remaining adverse effects.

Cultural resources related to the Cedar Ridge TCP would be affected by Alternative 3A: Proposed Action. This highly sensitive resource is a sacred place for the Eastern Shoshone Tribe of the Wind River Reservation, the Northern Arapaho Tribe of the Wind River Reservation, the Crow Tribe, the Northern Cheyenne Tribe, and, possibly, other tribes (Table 4-68). The tribes expressed concern about portions of this alternative route, due to the presence of cultural resources associated with the Cedar Ridge TCP.

Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbances could damage or destroy these resources if not mitigated.

Alternative 3B: Lost Creek to Lost Cabin

Intensive cultural resources surveys have been completed on 27 percent (12,614 acres) of Alternative 3B: Lost Creek to Lost Cabin. Twenty-four sites of potential tribal importance have been recorded (Table 4-69). Of the 24 known sites, 3 are in the direct effects APE. Only 36 percent of the direct effects APE corridor has been inventoried for cultural resources.

Over the entire length of Alternative 3B: Lost Creek to Lost Cabin, there is the potential for direct and/or indirect effects on an estimated 89 sites of potential tribal importance (Table 4-69). Of these sites, an estimated 4 sites would be subject to direct effects from the Project. In accordance with the Programmatic Agreement for the Project, a Class III cultural resources inventory will be required prior to construction. Site-specific avoidance and minimization measures will be instituted, and HPTPs will be developed and implemented, in consultation with the tribes, for any remaining adverse effects.

The Cedar Ridge TCP is in the vicinity of Alternative 3B: Lost Creek to Lost Cabin (approximately 5 miles to the northeast). Based on tribal input, this alternative route is acceptable to the tribes if located within the Lost Creek Pipeline corridor and with micro-siting in some locations to avoid sites of tribal importance.

Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbance could damage or destroy these resources if not mitigated.

Alternative 3C: Lost Creek to Highway 20/26

Intensive cultural resources surveys have been completed on approximately 24 percent (15,615 acres) of Alternative 3C: Lost Creek to Highway 20/26. Sixteen sites of potential tribal importance have been recorded (Table 4-69). Of the 16 known sites, 2 are in the direct effects APE. Only 42 percent of the direct effects APE corridor has been inventoried for cultural resources.

Over the entire length of Alternative 3C: Lost Creek to Highway 20/26, there is the potential for direct and/or indirect effects on an estimated 67 sites of potential tribal importance (Table 4-69). Of these, an estimated 3 sites would be subject to direct effects from the Project. In accordance with the Programmatic Agreement for the Project, a Class III cultural resources inventory will be required prior to construction. Site-specific avoidance and minimization measures will be instituted, and HPTPs will be developed and implemented, in consultation with the tribes, for any remaining adverse effects.

Under Alternative 3C: Lost Creek to Highway 20/26, there is the potential for direct and indirect effects on an area of concern to the Shoshone-Bannock Tribes of the Fort Hall Reservation. Unidentified resources that could be important to the tribes may be present. The tribes expressed their concern about portions of this alternative route and recommended that sensitive areas be avoided.

The Cedar Ridge TCP is located approximately 9 miles to the north of the centerline for Alternative 3C: Lost Creek to Highway 20/26 (outside of the Project area).

Continued consultation with Native American tribes and/or other interested parties potentially may identify additional resources of concern.

Potential impacts on cultural resources in the direct effects APE could be direct and permanent ground disturbance associated with the construction of pipelines/Riley Ridge Sweetening Plant and associated ancillary facilities, staging stations, and access roads and direct permanent disturbances due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts on cultural resources in the indirect effects APE could be indirect permanent disturbances due to changes in public accessibility and indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility. These types of disturbance could damage or destroy these resources if not mitigated.

4.3.8.5.5 230-Kilovolt Transmission Line

The number of sites of Native American concern that potentially would be subject to direct and/or indirect effects along this transmission line is unknown at this time. Additional tribal consultation, a literature search, and a Class III cultural resources inventory of the transmission line location would be required to determine potential effects on cultural resources of tribal importance. Cultural resources analysis is pending the BLM's receiving the right-of-way application from PacifiCorp.

4.3.8.5.6 Mainline Valve Distribution Lines

The number of sites of Native American concern that potentially would be subject to direct and/or indirect effects along the MLV distribution sites is unknown at this time. Additional tribal consultation, a literature search, and a Class III cultural resources inventory of final locations of MLV distribution lines would be required.

4.3.8.6 Summary Comparison of Alternative Routes

4.3.8.6.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Based on areas with existing inventories, Alternative 1A: Proposed Action potentially would affect the lowest number of known sites of potential tribal importance, followed by Alternative 1B: Dry Piney (Table 4-69). Alternative 1C: Figure Four potentially would affect the highest number of known sites of potential tribal importance. There are no known sites of potential tribal importance in the direct effects APE for Alternatives 1A: Proposed Action and 1B: Dry Piney.

Site projections, based on areas with existing inventories, indicate that Alternative 1A: Proposed Action is expected to have the fewest number of sites of potential tribal importance, followed by Alternative 1B: Dry Piney and Alternative 1C: Figure Four (Table 4-69).

In Segment 1, some of the tribes expressed concern about Alternative 1A: Proposed Action due to the presence of the Chimney Butte landscape. This potential TCP is in proximity to the alternative route (approximately 0.3 mile to the northeast). The tribes stated that tribal inventory of key landscapes such as Chimney Butte would take into account the viewshed and sacredness of the feature. Alternative 1B: Dry Piney and Alternative 1C: Figure Four avoid the Chimney Butte landscape. The tribes did not express specific concerns about Alternative 1B: Dry Piney or Alternative 1C: Figure Four. Based on the discussion during the field visit, there was no general consensus for Segment 1, since all the alternative routes were not visited.

The tribes expect that the Applicant will work diligently to avoid sites important to the tribes for any route selected for construction.

The Eastern Shoshone Tribe of the Wind River Reservation expressed concern about the pipeline crossing the Green River in Segment 1. The tribe is concerned about pipeline leakage or breakage and spills of CO_2 and H_2S gas into the Green River. It has been suggested that the pipeline be constructed above ground (especially at river crossings) as it would be more easily accessed, should problems arise. However, the tribe has noted there would be visual impacts, potential for vandalism, maintenance issues due to high winds, and greater surface disturbance if the pipeline crossing was above ground at the river crossing.

4.3.8.6.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Based on areas with existing inventories, Alternative 2A: Proposed Action potentially would affect the lowest number of known sites of potential tribal importance (Table 4-69). There are no known sites of potential tribal importance in the direct effects APE for Alternative 2A: Proposed Action.

Site projections, based on areas with existing inventories, indicate that Alternative 2A: Proposed Action is expected to have a lower number of sites of potential tribal importance than Alternative 2B: Southern Route (Table 4-69).

In Segment 2, the tribes did not express specific concerns about Alternative 2A: Proposed Action. Some of the tribes expressed serious concerns about portions of Alternative 2B: Southern Route because of its proximity to the Boars Tusk. Micro-siting may not be an appropriate action because the surrounding landscape is of importance to the tribes; however, the tribes would be consulted regarding micro-siting options. The Shoshone-Bannock Tribes of the Fort Hall Reservation have expressed specific concerns regarding public access and the impact of recreational use (e.g., climbing) on the Boars Tusk area. Based on the discussion during the field visit, Alternative 2A: Proposed Action is the preferred route for Segment 2.

The tribes expect that the Applicant will work diligently to avoid sites that are important to the tribes for any route selected for construction.

It should be noted that portions of the Segment 2 alternative routes in the Lander Field Office will be in existing utility corridors (Bairoil [below ground], Frontier [below ground], and Lost Creek [above ground or below ground]).

4.3.8.6.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Based on areas with existing inventories, Alternative 3C: Lost Creek to Highway 20/26 potentially would affect the lowest number of known sites, followed by Alternative 3B: Lost Creek to Lost Cabin (Table 4-69). Alternative 3A: Proposed Action potentially would affect the highest number of known sites of potential tribal importance. Alternative 3C: Lost Creek to Highway 20/26 has the lowest number of known sites of potential tribal importance in the direct effects APE, followed by Alternative 3B: Lost Creek to Lost Cabin and Alternative 3A: Proposed Action.

Site projections, based on areas with existing inventories, indicate that Alternative 3C: Lost Creek to Highway 20/26 is expected to have the lowest number of sites of potential tribal importance, followed by Alternative 3B: Lost Creek to Lost Cabin and Alternative 3A: Proposed Action (Table 4-69). Alternative 3C: Lost Creek to Highway 20/26 is expected to have the lowest number of sites in the direct effects APE, followed by Alternative 3B: Lost Creek to Lost Cabin and Alternative 3C: Lost Creek to Highway 20/26.

In Segment 3, sites associated with the Cedar Ridge TCP are located along Alternative 3A: Proposed Action. Some of the tribes expressed concern about portions of this alternative route, due to the presence of sites associated with the Cedar Ridge TCP. Additionally, the Cedar Ridge TCP and its periphery are in the vicinity of Alternative 3B: Lost Creek to Lost Cabin. Alternative 3B: Lost Creek to Lost Cabin is acceptable to the tribes if located within the Lost Creek Pipeline corridor and with micro-siting in some locations to avoid sites of Native American concern. The tribes expressed concern about portions of Alternative 3C: Lost Creek to Highway 20/26, due to the presence of known sites of tribal concern. Unidentified resources that could be important to the tribes may be present. Tribal input from the Shoshone-Bannock Tribes of the Fort Hall Reservation indicates the tribes' preference for Alternative 3B: Lost Creek to Lost Cabin to avoid sites of tribal importance along Alternative 3C: Lost Creek to Highway 20/26. Alternative 3B: Lost Creek to Lost Cabin is preferable as long as significant sites and sensitive areas are avoided. The tribes expect that the Applicant will work diligently to avoid sites important to the tribes for any route selected for construction.

It should be noted that the Segment 3 alternative routes will be in existing utility corridors in the Lander Field Office (Bairoil [below ground], Frontier [below ground], Highway 20/26 [overhead or below ground], Lost Creek [overhead or below ground], and Sand Draw to Casper [overhead or below ground]) and in the Casper Field Office (D6067, 6068, and Cabin Creek utility corridors).

4.3.9 Noise

4.3.9.1 Issues Identified for Analysis

Noise issues identified during internal coordination and agency and public scoping included:

- Potential direct and indirect conflicts with existing noise-sensitive receptors, including residences, recreation areas, fishing access sites, campgrounds, schools, churches, WSAs, greater sage-grouse and other noise-sensitive wildlife, such as raptors and big game species
- Prohibition of construction between March 1 and May 15 in greater sage-grouse core areas, so Project noise does not exceed an L_{50} noise level that is 10 dBA above the baseline ambient noise level (L_{90}) at lek perimeter (L_{50} 30 dBA vs. L_{90} 20 dBA)
- Maintenance of a 2-mile seasonal buffer of greater sage-grouse non-core areas, from March 15 to June 30, for occupied leks where breeding, nesting, and early brood-rearing habitat is present

4.3.9.2 Types of Potential Effects

Noise associated with the construction, operation, and maintenance of the Project could have direct, indirect, and residual effects on existing and future noise-sensitive human and wildlife receptors. The noise analysis determined the potential effects of the Project on the existing noise environment and receptor locations, both short-term (temporary noise during construction and maintenance of the pipeline and the Riley Ridge Sweetening Plant) and long term (ongoing noise of the Riley Ridge Sweetening Plant operations). The Project could result in the following potential effects on human or wildlife noise-sensitive receptors:

- **Impacts on Humans.** Direct impacts include annoyance. Indirect effects may include speech interference, stress reactions, sleep interference, lower morale, efficiency reduction, and fatigue (Harris 1998).
- **Impacts on Wildlife.** Response to noise is a function of many variables, including characteristics and duration of the noise; life-history characteristics of the species; habitat type, season, and current activity of the animal; the animal's sex, age, and previous noise exposure; and other physical stressors, such as drought. Different species have different levels of noise tolerance, habituation, and displacement as documented in Section 4.3.23.5.

Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.9.3 Criteria for Assessing Impacts

Criteria for assessing noise impacts are different from other resources because noise analysis is tied to EPA's Noise Control Act of 1972. This regulation provides guidance for analyzing acceptable noise levels under various conditions that would protect public health and welfare with an adequate margin of safety. Refer to Section 3.2.9 for further detail regarding the regulatory guidelines for noise resources.

4.3.9.4 Mitigation Planning

Initial impacts are those effects resulting from the implementation of the Project, including implementation of design features of the Proposed Action for environmental protection (Table 2-18). The specific design features of the Proposed Action for environmental protection relevant to noise include:

- **Design Feature 21 (mitigation measure development).** Applied to limit noise during construction, maintenance and operational phases of the Project.

- **Design Feature 23 (noise – construction).** Applied to reduce audible noise to limit human annoyance and wildlife disturbance.
- **Design Feature 24 (noise – road use).** Applied to reduce noise and minimize human annoyance and wildlife disturbance.

Residual impacts represent anticipated impacts on noise levels that would remain after implementation of agency-required mitigation measures (refer to Table 4-2). The level of potential residual impacts on noise resources associated with implementation of the Project was assessed using the criteria presented in Table 4-70. The agency-required mitigation measures applied to avoid, reduce, or minimize impacts on noise resources include:

- **Agency-Required Mitigation Measure 1 (sensitive resource avoidance).** Applied to reduce the width of the right-of-way and allow for micro-siting or construction noise mitigation techniques to reduce noise impacts.
- **Agency-Required Mitigation Measure 7 (seasonal restrictions).** Applied to restrict construction, operation, and maintenance activities during sensitive periods for wildlife to avoid potential noise impacts.
- **Agency-Required Mitigation Measure 9 (minimize new or improved accessibility).** Applied to closing and rehabilitating construction access roads, which would minimize vehicle noise, stress, and disturbance to wildlife.
- **Agency-Required Mitigation Measure 10 (limit accessibility in sensitive habitats).** Applied to limit accessibility to sensitive habitats to protect seasonal wildlife habitats from noise disturbance.

Additional mitigation measures specific to the Riley Ridge Sweetening Plant construction and operation may be required to ensure compliance with federal noise guidelines following completion of noise calculations based on final manufacturer's operating specifications for selected turbine drivers.

4.3.9.5 Analysis Approach

Noise levels are quantified using units of dBA. Humans typically have reduced hearing sensitivity at low frequencies compared with their response at high frequencies. The "A-weighting" of noise levels, or dBA, closely correlates to the frequency response of normal human hearing (250 to 4,000 hertz). Noise levels typically decrease by approximately 6 dBA every time the distance between the source and receptor is doubled, depending on the characteristics of the source and the conditions over the path that the noise travels. The reduction in noise levels can be increased if a solid barrier or natural topography blocks the line of sight between the source and receptor.

For environmental noise studies, noise levels are typically described using A-weighted equivalent noise levels, L_{eq}, during a certain time period. The L_{eq} metric is useful because it uses a single number, similar to an average, to describe the constantly fluctuating instantaneous noise levels at a receptor location during a period of time. The 90th percentile-exceeded noise level, L_{90}, is typically considered the ambient noise level, and is often near the low end of the instantaneous noise levels during a measurement period. It typically does not include the influence of discrete noises of short duration, such as bird chirps, backup alarm, vehicle pass-by, etc. The 50th percentile-exceeded noise level, L_{50}, is a metric that represents the single noise level exceeded during 50 percent of a measurement period.

The day-night average noise level, L_{dn}, is a single number descriptor that represents the constantly varying sound level during a continuous 24-hour period. The L_{dn} can be determined using 24 consecutive one-hour L_{eq} noise levels, or estimated using measured L_{eq} noise levels during shorter time periods. The L_{dn}

includes a 10-dBA penalty that is added to noises that occur during the nighttime hours between 10:00 p.m. and 7:00 a.m., to account for people's higher sensitivity to noise at night when the background noise level is typically low.

Noise levels were predicted using the Cadna-A Version 4.5 software from DataKustik. Cadna-A uses algorithms from the International Organization for Standardization Standard 9613-2, *Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation* (International Organization for Standardization 1996). This standard specifies the calculations to determine the reduction in noise levels due to the distance between the noise source and the receiver, the effect of the ground on the propagation of sound, and the effectiveness of natural barriers due to grade or man-made barriers, such as walls. The predicted noise levels conservatively assume a direct line of sight exists between a noise source and a receptor location and that atmospheric conditions are favorable for sound propagation. Favorable atmospheric conditions for noise propagation mean that a light wind is blowing from a source to a receiver and a well-developed temperature inversion is in place. However, atmospheric conditions can vary dramatically at large distances between a noise source and a receptor. Therefore, the estimated Project noise levels should be assumed to be average noise levels, and temporary significant positive and negative deviations from the averages can occur (Harris 1998).

To maintain seasonal stipulations, the pipeline will be constructed during the daytime hours from August 1 to December 15 over a 2-year period. The sounds of the pipeline construction activities will be intermittent from diesel-powered heavy equipment. Noise levels at a listener location vary depending on the phase of construction; the type, operation, duration, and location of equipment; the number of pieces of equipment used simultaneously; and whether a direct line of sight is available between the equipment and a listener. For pipeline construction, the noise analysis assumed that three pieces of diesel-powered equipment, such as scrapers, dozers, ditching machines, excavators, tractor trailers, graders, etc., would be operating simultaneously in proximity to each other. The typical noise level of each piece of equipment is approximately L_{max} 85 dBA at 50 feet from the equipment (FTA 2006).

During pipeline construction HDD is planned for boring under the Green River, Big Sandy River and Sweetwater River and may require 24-hour operations. Typical HDD operations are L_{eq} 71 dBA at 300 feet away (Federal Energy Regulatory Commission 2008).

Blasting may be required during construction in areas with shallow depth-to-bedrock (SWCA 2014e). Blasting noise depends on the weight of explosive used per delay and will depend on the ground conditions encountered during construction. Blast noise will be clearly audible in the area, but will be a brief, temporary, and short-term noise event.

The Riley Ridge Sweetening Plant will require 24-months for construction, with timing subject to environmental stipulations. Construction equipment will include diesel-powered equipment and a drill rig to construct the two gas injection wells. For the noise analysis, it was assumed that up to five pieces of diesel-powered equipment, such as scrapers, dozers, backhoes, graders, and belly-dump trucks, would operate simultaneously during site and drill pad preparation. Drilling operations will require a drill rig, haul trucks, and other diesel-powered equipment. Large drill rigs are typically L_{eq} 54 dBA at 980 feet (Ambrose and Florian 2013).

Once construction is complete, the operational noise of the Project will consist of the Riley Ridge Sweetening Plant and the two gas injection wells, and the noise analysis assumed all these components will operate simultaneously for the 50-year life span. Plant noise is typically L_{eq} 46 dBA at 500 feet, and injection well noise is typically L_{eq} 56 dBA at 330 feet (Ambrose and Florian 2013).

To determine the direct and indirect effects at noise-sensitive receptors during construction of the pipeline and Riley Ridge Sweetening Plant, predicted noise levels were compared to the applicable noise

regulations listed in Chapter 3, Section 3.2.9, Table 3-68 and the FTA construction L_{eq} guidelines in Table 3-69. The predicted Riley Ridge Sweetening Plant operational noise levels were compared to the EPA L_{dn} 55 dBA guideline at the closest human receptors. The predicted Riley Ridge Sweetening Plant L_{50} construction and operational noise levels were also compared to the estimated ambient L_{90} noise levels to determine compliance with greater sage-grouse regulations. The L_{90} 20 dBA baseline ambient noise level for this Project is based on the measured ambient noise levels at 19 sage-grouse leks over multiple days and atmospheric conditions in the Pinedale Anticline Project Area (Ambrose and Florian 2013).

Comparing the Project L_{eq} noise levels to the L_{90} (ambient) noise level at a receptor location helps approximate whether a noise source will be audible and how significantly the ambient environment will change due to a new noise source. At 10 dBA above the ambient noise level and higher (L_{eq} 30 dBA or higher compared to the baseline ambient noise level L_{90} 20 dBA), an intruding noise source is typically considered clearly audible. Between the existing ambient noise level and 10 dBA above the ambient noise level (L_{eq} 20 to 29 dBA), intruding noises are occasionally audible. When the noise source is equal to or less than the ambient noise level (L_{eq} 20 dBA), the noise source is rarely audible, if at all (Cavanaugh and Tocci 2002).

4.3.9.6 Results (Direct and Indirect Residual Effects)

Table 4-70 lists the predicted noise levels for each Project phase at distances between 0.5 and 2.0 miles from the noise source. The table also lists the approximate distances that each noise-generating activity is predicted to equal, the existing ambient (background) noise level (L_{90} 20 dBA), and the ambient plus 10 dBA noise level (L_{eq} or L_{50} 30 dBA) (Section 3.2.9). The data presented in the following tables assume a direct line of sight is available between a noise source and a receptor location and does not include the influence of other intermittent and sporadic noise sources, such as wind blowing through vegetation, vehicles driving by on roads, etc. If the line of sight is blocked by terrain at a particular receptor location, the Project levels shown will be reduced by 5 dBA or more depending on the height and extent of the obstruction. Other brief or intermittent noise sources may temporarily mask the Project noise if loud enough, but the measured ambient noise levels in the Project area indicate a predominantly quiet environment (Ambrose and Florian 2013).

Table 4-70
Project Estimated Noise Levels by Activity

Noise-Generating Activity	Noise Level (L_{eq}) at Distance (dBA)				Miles to Ambient plus 10 dBA Noise Level ($L_{eq\ or}\ L_{50}$ 30 dBA)	Miles to Ambient Noise Level (L_{90} 20 dBA)
	0.5 mile (2,640 feet)	1 mile (5,280 feet)	1.5 miles (7,920 feet)	2 miles (10,560 feet)		
Pipeline Construction	47	38	33	29	1.8	3.5
Horizontal Directional Drill Construction	51	43	38	34	2.6	4.7
Riley Ridge Sweetening Plant Construction	55	47	42	39	3.8	8.2
Riley Ridge Sweetening Plant Operations	36	29	26	23	0.9	2.8

SOURCE: FTA 2006, Egan 1988
NOTES:
dBA = Decibel (A-Weighted)
L_{eq} 80 dBA = FTA Residential 8-Hour Daytime Construction Noise Guideline (Table 3-69)
L_{eq} 70 dBA = FTA Residential 8-Hour Nighttime Construction Noise Guideline (Table 3-69)
L_{eq} or L_{50} 40 to 59 dBA = Clearly audible/moderate noise level
L_{eq} or L_{50} 30 to 39 dBA = Clearly audible/faint noise level
L_{eq} or L_{50} 20 to 29 dBA = Occasionally audible/faint noise level

Construction noise will be localized, short-term and temporary. The pipeline construction noise is estimated to be clearly audible within 1.8 miles away from the diesel-powered equipment and up to 2.6 miles away from the HDD equipment but may be occasionally audible at greater distances when not masked by other manmade or natural noise sources, such as industrial sources, traffic, and wind (Table 3-70). Due to the higher drill rig noise levels, the Riley Ridge Sweetening Plant construction noise levels are estimated to be clearly audible up to 3.8 miles away but may be occasionally audible at greater distances (Table 4-70).

The long-term noise levels associated with the Riley Ridge Sweetening Plant operation are predicted to be clearly audible up to 0.9 mile from the plant but may be occasionally audible within 2.8 miles from the plant (Table 4-70).

4.3.9.6.1 Sound Levels and Noise-Sensitive Areas (Direct and Indirect)

4.3.9.6.1.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment will remain as it presently exists.

4.3.9.6.1.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction

For the construction of the Riley Ridge Sweetening Plant, the combined noise of construction and drilling equipment is predicted to be L_{eq} 80 dBA at 200 feet from the equipment, and the closest human noise receptors (fishing access sites and residences) are located 7 to 8 miles northwest (Table 3-71). The closest wildlife receptors are documented in Section 4.3.23.5. The West Buckhorn Draw lek is the closest greater sage-grouse lek to the Riley Ridge Sweetening Plant and is in a non-core population area approximately 2.1 miles northeast of the plant. Although this lek is beyond the 2-mile buffer stipulated from March 15 to June 30 for non-core areas (Table 3-68), the plant construction noise is predicted to be clearly audible within approximately 3.8 miles of the site but occasionally audible at greater distances when not masked by other manmade or natural noise sources (Table 3-70 and Table 4-70). Suggested preconstruction surveys and seasonal construction stipulations for wildlife are included in Section 4.3.23.5. It is anticipated that the Riley Ridge Sweetening Plant and injection well construction will take 2 years to complete, and the limited construction period should have low residual noise effects on wildlife receptors (refer to Section 4.3.23.5).

Once operational, the Riley Ridge Sweetening Plant operations are predicted to be clearly audible within 0.9 mile of the plant but occasionally audible at greater distances when not masked by other manmade or natural noise sources (Table 3-70 and Table 4-70). Due to the absence of nearby human receptors, the plant operations will not exceed the EPA L_{dn} 55 dBA guideline (Table 3-68), and no residual human noise effects are anticipated. However, the plant operations will change the acoustical environment with potential moderate effects on wildlife living or migrating within 0.9 mile of the plant as discussed in Section 4.3.23.5. The closest sage-grouse lek is located approximately 2.1 miles from the Riley Ridge Sweetening Plant, and the operational noise level is predicted to be L_{50} 23 dBA at the lek, which is less than the L_{50} 30 dBA threshold compared to the baseline ambient noise level L_{90} 20 dBA (Table 3-68). However, the operational noise can be further reduced by implementing the Riley Ridge Sweetening Plant mitigation techniques listed in Section 4.3.9.4.

Injection Wells

No long-term or short-term noise impacts have been identified specific to the proposed injection wells.

Segment 1 Pipeline Alternative Routes

The pipeline construction noise (without HDD) is predicted to be approximately L_{eq} 80 dBA at 100 feet from the diesel-powered equipment. Referring to Table 3-71, Segment 1 receptors are not located closer than within 800 or 900 feet of the 1A: Proposed Action or other route centerlines. Therefore, the pipeline construction noise is not predicted to exceed the FTA residential daytime L_{eq} 80 dBA construction noise guideline (Table 3-69) at the nearby rural residences and fishing access sites.

Referring to Table 4-71, construction noise (without HDD) may be clearly audible within 1.8 miles of the equipment when not masked by other manmade or natural noise sources. There are 11 receptors located within 2 miles of Alternatives 1A: Proposed Action and 1B: Dry Piney (4 within 0.5 mile) and 17 along Alternative 1C: Figure Four (3 within 0.5 mile). Moderate construction noise levels are predicted at the receptors located within 0.5 mile, possibly resulting in human annoyance and wildlife disturbance. However, construction noise can be reduced by implementing the mitigation techniques listed in Section 4.3.9.4. Construction noise is also temporary and short-term, and no residual noise effects are anticipated for the human and wildlife receptors (refer to Section 4.3.23.5).

Table 4-71
Estimated Pipeline Construction Noise Levels (L_{eq}) and Distances and Receptors for Segment 1

Alternative Route	0.5 mile (2,640 feet)	1 mile (5,280 feet)	1.5 miles (7,920 feet)	2 miles (10,560 feet)	Distance to Ambient plus 10 dBA Noise Level ($L_{eq\ or}\ L_{50}$ 30 dBA)	Distance to Ambient Noise Level (L_{90} 20 dBA)
	47 dBA[1]	38 dBA[2]	33 dBA[2]	29 dBA[3]		
	Number of Receptors Located within Distance[4]					
1A: Proposed Action	4	1	3	3	1.8 miles	3.5 miles
1A Variation: Dry Basin Draw	0	0	0	0		
1B: Dry Piney	4	1	3	3		
1C: Figure Four	3	1	4	9		

SOURCE: FTA 2006, Egan 1988
NOTES:
[1]L_{eq} or L_{50} 40 to 59 dBA = Clearly audible/moderate noise level
[2]L_{eq} or L_{50} 30 to 39 dBA = Clearly audible/faint noise level
[3]L_{eq} or L_{50} 20 to 29 dBA = Occasionally audible/faint noise level
[4]Noise-sensitive receptors located within 2 miles of the Segment 1 routes are listed in Table 3-71.
L_{eq} 80 dBA = FTA Residential 8-hour Daytime Construction Noise Guideline (Table 3-69)

During construction, HDD equipment will be required at the Green River crossing. HDD noise levels are predicted to be approximately L_{eq} 70 dBA at 380 feet away and may be clearly audible within 2.6 miles and may be occasionally audible at greater distances when not masked by other manmade or natural noise sources (Table 3-70 and Table 4-70). The closest receptors to the crossing are approximately 1,525 feet from the 1A: Proposed Action and 1B: Dry Piney routes, and 1,910 feet from 1C: Figure Four. Therefore, the HDD operation noise during construction is not predicted to exceed the FTA residential nighttime L_{eq} 70 dBA guideline at any receptors in Segment 1. HDD noise is temporary and short-term, will only persist for as long as the river crossing requires during construction, and no residual noise effects are anticipated for the human and wildlife receptors (refer to Section 4.3.23.5).

4.3.9.6.1.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

The Segment 2 pipeline construction and HDD estimated noise levels are the same as documented for Segment 1 in Section 4.3.9.6.1.2. Referring to Table 3-72, the closest residences are 0.5 mile from 2A: Proposed Action and 1.4 miles from 2B: Southern Route. Five WSAs and a campground are also located adjacent to 2B: Southern Route. HDD will be required at the Big Sandy River crossing located at least 3.3 miles from 2A: Proposed Action receptors. Construction and HDD noise will not exceed the FTA noise

guidelines (Table 3-69) at the receptors located within 2 miles of the alternative routes (Table 4-72). Referring to Table 4-71, construction noise (without HDD) may be clearly audible within 1.8 miles of the equipment when not masked by other manmade or natural noise sources (Table 3-70). Construction and HDD noise is temporary and short-term, and no residual noise effects are anticipated for human or wildlife receptors due to distance to receptor and seasonal restrictions, respectively (refer to Section 4.3.23.5). Opportunities for solitude will be diminished temporarily at the WSAs and campground during construction, but sound levels will return to ambient conditions once the construction is completed.

Table 4-72
Estimated Pipeline Construction Noise Levels (L_{eq}) and Distances and Receptors for Segment 2

Alternative Route	0.5 mile (2,640 feet)	1 mile (5,280 feet)	1.5 miles (7,920 feet)	2 miles (10,560 feet)	Distance to Ambient plus 10 dBA Noise Level ($L_{eq\ or}\ L_{50}$ 30 dBA)	Distance to Ambient Noise Level (L_{90} 20 dBA)
	47 dBA[1]	38 dBA[2]	33 dBA[2]	29 dBA[3]		
	Number of Receptors Located within Distance[4]					
2A: Proposed Action	2	0	0	2	1.8 miles	3.5 miles
2B: Southern Route	2	2	2	1		

SOURCE: FTA 2006, Egan 1988
NOTES:
[1]L_{eq} or L_{50} 40 to 59 dBA = Clearly audible/moderate noise level
[2]L_{eq} or L_{50} 30 to 39 dBA = Clearly audible/faint noise level
[3]L_{eq} or L_{50} 20 to 29 dBA = Occasionally audible/faint noise level
[4]Noise-sensitive receptors located within 2 miles of the Segment 2 routes are listed in Table 3-72.
L_{eq} 80 dBA = FTA Residential 8-hour Daytime Construction Noise Guideline (Table 3-69)

As documented in Section 4.3.10, 2A: Proposed Action crosses the southern boundary of three lands with wilderness characteristics, North Pacific Creek (Unit WY040-2011-059), Mowing Machine Draw (Unit WY040-2011-069), and Bush Creek (Unit WY040-2011-074). Alternatives 2A: Proposed Action and 2B: Southern Route also travel through the Great Divide Basin crossing the CDNST (Section 4.3.7) and other BLM management areas (Section 4.3.16). Noise will also increase due to pipeline construction in these areas and opportunities for solitude will be diminished temporarily, but sound levels will return to ambient conditions once the construction is completed.

4.3.9.6.1.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Referring to Table 4-73, Segment 3 is the most populated segment, including the towns of Jeffrey City, Lost Cabin, and Powder River with residential, church, and school noise receptors, as well as rural ranches and recreation areas, within 1.5 miles of the routes. Pipeline construction noise is predicted to be 10 dBA above the ambient (background) noise level and to be clearly audible within 1.8 miles from the pipeline construction (without HDD) equipment when not masked by other manmade or natural noise sources (Table 3-70 and Table 4-70).

Table 4-73
Estimated Pipeline Construction Noise Levels (L_{eq}) and Distances and Receptors for Segment 3

Alternative Route	100 feet	700 feet	0.5 mile (2,640 feet)	1 mile (5,280 feet)	1.5 miles (7,920 feet)	2 miles (10,560 feet)	Total Receptors per Route	Distance to Ambient plus 10 dBA Noise Level (L_{eq} or L_{50} 30 dBA)	Distance to Ambient Noise Level (L_{90} 20 dBA)
	80 dBA[1]	60 dBA[2]	47 dBA[3]	38 dBA[4]	33 dBA[4]	29 dBA[5]			
	Number of Receptors Located within Distance[6]								
3A: Proposed Action	0	1	38	3	22	0	64	1.8 miles	3.5 miles
3B: Lost Creek to Lost Cabin	1	1	35	4	5	0	46		
3C: Lost Creek to Highway 20/26	1	19	50	5	2	0	77		

SOURCE: FTA 2006, Egan 1988
NOTES:
[1]L_{eq} or L_{50} 80 to 99 dBA = Clearly audible/very loud noise level
[2]L_{eq} or L_{50} 40 to 59 dBA = Clearly audible/moderate noise level
[3]L_{eq} or L_{50} 30 to 39 dBA = Clearly audible/faint noise level
[4]L_{eq} or L_{50} 20 to 29 dBA = Occasionally audible/faint noise level
[5]Noise-sensitive receptors located within 2 miles of the Segment 3 routes are listed in Table 3-73.
L_{eq} 80 dBA = FTA Residential 8-Hour Daytime Construction Noise Guideline (Table 3-69)

Alternative 3A: Proposed Action

As shown in Table 4-73, 64 noise-sensitive receptors (primarily in Jeffrey City and Powder River) were identified within 1.5 miles of the Alternative 3A: Proposed Action centerline, with 39 located within 0.5 mile. The pipeline construction noise is predicted to be approximately L_{eq} 80 dBA at 100 feet from the equipment. Since the closest residence in Jeffrey City is 440 feet from the centerline (common to all three routes) (Table 3-73), the pipeline construction noise is not predicted to exceed the FTA residential daytime L_{eq} 80 dBA noise guideline (Table 3-69) at this distance. However, the construction noise levels are predicted to be L_{eq} 47 to 60 dBA (moderate to loud noise levels) at the 39 receptors located within 0.5 mile, with potential moderate noise effects resulting in human annoyance and wildlife disturbance. Construction noise should be reduced by implementing the noise mitigation techniques listed in Section 4.3.9.4, such as micro- siting, using upgraded construction equipment and using temporary barriers. Construction noise is temporary and short-term, and no residual noise effects are anticipated for human or wildlife receptors due to seasonal restrictions (refer to Section 4.3.23.5).

During construction, HDD will be required at the Sweetwater River crossing with the closest receptor located north of Jeffrey City, 6,100 feet away and common to all three alternative routes (Table 3-73). The HDD operation will not exceed the FTA daytime or nighttime noise guidelines (Table 3-69) but may be clearly audible within 2.6 miles (Table 4-70). HDD noise is temporary and short-term and will only persist for as long as the river crossing requires during construction.

Alternative 3B: Lost Creek to Lost Cabin

The fewest human noise receptors (46) were identified within 2 miles of Alternative 3B: Lost Creek to Lost Cabin, including 37 within 0.5 mile, with predicted moderate to very loud construction noise levels (Table 4-73) and potential moderate noise effects possibly resulting in human annoyance and wildlife disturbance. The closest residence is 70 feet east of the centerline (also common to Alternative 3C: Lost Creek to Highway 20/26) (Table 3-73), which exceeds the FTA residential daytime L_{eq} 80 dBA noise guideline (Table 3-69) and directly affects the acoustical environment at the nearby ranch during

construction. Construction noise should be mitigated (Section 4.3.9.3) for all nearby receptors, using micro-siting, upgraded construction equipment, and temporary barriers. However, construction noise is temporary and short-term, and no residual noise effects are anticipated for human or wildlife receptors, due to seasonal restrictions (refer to Section 4.3.23.5).

Alternative 3C: Lost Creek to Highway 20/26

The most human noise receptors (77) were identified within 2 miles of Alternative 3C: Lost Creek to Highway 20/26 (70 within 0.5 mile), including 19 within 700 feet (primarily along Highway 20/26 and in Powder River) and one within 70 feet (closest receptor) as described above (Table 4-73) exceeding the FTA noise guideline and directly affecting the acoustical environment at the ranch. During construction, the nearby receptors will be subject to moderate to very loud construction noise levels with potential moderate noise effects possibly resulting in human annoyance and wildlife disturbance. Construction noise should be mitigated (Section 4.3.9.4) for all nearby receptors, using micro-siting, upgraded construction equipment, and temporary barriers. However, construction noise is temporary and short-term, and no residual noise effects are anticipated for human or wildlife receptors, due to seasonal restrictions (refer to Section 4.3.23.5).

4.3.9.6.1.5 230-Kilovolt Transmission Line

Construction of the transmission line to the Riley Ridge Sweetening Plant will produce intermittent noise due to diesel-powered heavy equipment. Short-term use of equipment, such as backhoes, cranes, front-end loaders, bulldozers, graders, excavators, compressors, generators, large augers and various trucks, may be required for construction. The typical noise level of each piece of equipment is approximately L_{max} 85 dBA at 50 feet (FTA 2006). Assuming the transmission line construction noise requires three pieces of diesel-powered equipment operating simultaneously in the same vicinity, the noise level is predicted to be approximately L_{eq} 80 dBA at 100 feet. Therefore, the construction noise may be audible within 1.8 miles of the equipment (Table 4-59) but the closest residences are located 7 to 8 miles northwest (Table 3-71). As documented in Section 4.2.23, wildlife species inhabit or pass through the transmission line corridor, but construction noise can be reduced by implementing the mitigation techniques listed in Section 4.3.9.4. Construction noise is also temporary and short-term, and no residual noise effects are anticipated for the human and wildlife receptors (refer to Section 4.3.23.5).

Once operational, transmission lines have the potential to emit noise under certain operating and environmental conditions. Transmission line noise (also called corona noise) is caused by the partial electrical breakdown of the insulating properties of air around the electrical conductors and overhead power lines. Corona-generated noise is often described as a hum or buzz, and is primarily audible in foul weather with precipitation (i.e., rain or wet snow). Generally, the fair-weather audible noise of transmission lines cannot be distinguished from the ambient noise.

The calculated distance for a 230kV transmission line to meet the EPA L_{dn} 55 dBA guideline (Table 3-68) is 63 feet from the line (BLM 2013b). Due to the absence of nearby human receptors and minimal noise produced by the transmission line, and no residual human or wildlife noise effects are anticipated.

4.3.9.6.1.6 Mainline Valve Distribution Lines

Distribution lines will be required to power the MLVs along the pipeline. Construction of the 110/220 voltage lines and access roads will produce intermittent noise due to diesel-powered heavy with and approximate noise level of L_{eq} 80 dBA at 100 feet. Construction noise may be audible within 1.8 miles (Table 4-70); possibly disturbing noise-sensitive human wildlife receptors, but construction noise is temporary. Corona-generated noise is possible due to the operation of the distribution lines during wet weather, but no noise effects are anticipated. Operational noise would be eliminated when burying the distribution lines or utilizing solar power.

4.3.9.7 Summary Comparison of Alternative Routes

In Segment 1, 11 noise receptors are located within 2 miles of 1A: Proposed Action and 1B: Dry Piney routes (4 within 0.5 mile) verses 17 along 1C: Figure Four (3 within 0.5 mile) (Table 4-71). Moderate construction noise levels are predicted at the receptors located within 0.5 mile, possibly resulting in human annoyance and wildlife disturbance. However, construction noise is temporary and short-term and could be reduced by implementing the mitigation techniques listed in Section 4.3.9.4.

In Segment 2, 4 noise receptors are located within 2 miles of 2A: Proposed Action (2 within 0.5 mile) verses 7 along 2B: Southern Route (2 within 0.5 mile), including 5 WSAs (Table 4-72). Therefore, less noise effects are anticipated for the 2A: Proposed Action. However, construction noise is temporary and short-term and could be reduced by implementing the mitigation techniques listed in Section 4.3.9.4.

In Segment 3, the fewest human noise receptors (46) were identified within 2 miles of Alternative 3B: Lost Creek to Lost Cabin, including 37 within 0.5 mile, with predicted moderate to very loud construction noise levels (Table 4-73) possibly resulting in human annoyance and wildlife disturbance. The closest residence is 70 feet east of the centerline (also common to Alternative 3C: Lost Cabin to Highway 20/26) (Table 3-73), and construction noise is predicted to exceed the FTA residential daytime L_{eq} 80 dBA noise guideline (Table 3-69), directly affecting the acoustical environment at the nearby ranch during construction. Construction noise should be mitigated (Section 4.3.9.4) for all nearby receptors, using micro-siting, upgraded construction equipment, and temporary barriers. For comparison, 64 noise-sensitive receptors (primarily in Jeffrey City and Powder River) were identified within 1.5 miles of Alternative 3A: Proposed Action (39 within 0.5 mile). The most human noise receptors (77) were identified within 2 miles of Alternative 3C: Lost Creek to Highway 20/26 (70 within 0.5 mile), including 19 within 700 feet (primarily along Highway 20/26 and in Powder River) and one within 70 feet. However, construction noise is temporary and short-term and the sound levels will return to ambient conditions once the construction is completed.

4.3.10 Lands with Wilderness Characteristics

4.3.10.1 Issues Identified for Analysis

The potential for effects on lands with wilderness characteristics units from the construction, operation, and maintenance of the Project was identified as an issue for analysis by the BLM. Additionally, the BLM also requires an assessment of compliance with BLM RMP management objectives and decisions for lands with wilderness characteristics that have been analyzed in a land use plan."

4.3.10.2 Types of Potential Effects

Direct effects on the inventoried wilderness characteristics on lands with wilderness characteristics associated with construction, operation, and maintenance activities could include impacts on wilderness characteristics from the pipelines and ancillary facilities. Some examples of these impacts include reduction in size, reduction in opportunity for solitude or primitive and unconfined recreation, diminished naturalness in the setting, and introduction of new access to the area.

In addition, potential impacts on lands with wilderness characteristics that have not yet been through the BLM planning process could include future limitation of management options related to wilderness characteristics.

Indirect effects on the inventoried wilderness characteristics of lands with wilderness characteristics could occur if temporary or permanent access routes were to result in increased access to lands with wilderness characteristics.

Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.10.3 Criteria for Assessing Impacts

A qualitative assessment was conducted for each area to assess (1) the Project's potential effects on inventoried wilderness characteristics units identified for lands with wilderness characteristics and, if applicable, (2) conformance with land-use planning objectives, as identified in each field office RMP, for the units.

4.3.10.4 Mitigation Planning

Mitigation measures were not considered to specifically mitigate impacts on inventoried wilderness characteristics identified for lands with wilderness characteristics; rather, where warranted, agency-required mitigation measures were applied to mitigate high or moderate initial impacts on a particular resource (e.g., sage-grouse habitat and visual resources) and are discussed for each applicable resource section of the EIS.

4.3.10.5 Results (Direct and Indirect Residual Effects)

Inventory and impact results for this section are displayed on MV-7. Table 4-74 indicates the miles of pipeline alternative routes that cross lands with wilderness characteristics units within the Project area.

Table 4-74
Lands with Wilderness Characteristics Inventory Data

Alternative Route	Miles Crossed of Inventoried Areas	Wilderness Characteristics Found
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant		
1A: Proposed Action	25.5	No
1A Variation: Dry Basin Draw	25.8	No
1B: Dry Piney	26.0	No
1C: Figure Four	32.5	No
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect		
2A: Proposed Action	93.4	Yes
2B: Southern Route	96.8	No
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect		
3A: Proposed Action	3.9	No
3B: Lost Creek to Lost Cabin	3.9	No
3C: Lost Creek to Highway 20/26	3.9	No

4.3.10.5.1 No Action Alternative

Under the No Action Alternative, the right-of-way grant on BLM-administered lands would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.10.5.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction

The proposed Riley Ridge Sweetening Plant is not located within lands with wilderness characteristics. Therefore, there would be no impact from construction or operation of the Riley Ridge Sweetening Plant.

Injection Wells

The proposed injection wells are not located within any lands with wilderness characteristics. Therefore, there would be no impact from construction or operation of the injection wells.

Segment 1 Pipeline Alternative Routes

There are no lands with wilderness characteristics crossed by Segment 1 alternative routes. Therefore, there would be no identifiable impact from construction, operation, or maintenance of the Project on lands with wilderness characteristics within Segment 1 of the Project area.

4.3.10.5.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Alternative 2A: Proposed Action crosses about 7.3 miles of lands with wilderness characteristics units. These crossings occur along the southernmost boundary of these areas (MV-7). Table 4-75 describes the status of the lands with wilderness characteristics crossed within Segment 2 of the Project area.

Table 4-75
Lands with Wilderness Characteristics Crossed in the Rock Springs Field Office in Segment 2

Unit ID/ Name	Approximate Unit Size (Acres)	Meets Lands with Wilderness Characteristics?	Wilderness Inventory Characteristic Values					BLM Management Decision?	Crossed by Centerline of Alternative Route?
			Sufficient Size	Naturalness	Solitude	Primitive and Unconfined Recreation	Supplemental Values		
WY040-2011-059	8,014	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes – 2A: Proposed Action
WY040-2011-069	8,115	Yes	Yes	Yes	Yes	Yes	Yes	No	No, adjacent to County Road 21 at southern boundary
WY040-2011-074	8,236	Yes	Yes	Yes	Yes	Yes	Yes	No	No, adjacent to County Road 21 at southern boundary

SOURCE: BLM 2011b. BLM 2011c. and BLM 2011d

The units identified in Table 4-75 are all crossed by Alternative 2A: Proposed Action. Information regarding each unit is described below:

North Pacific Creek (Unit WY040-2011-059) is crossed by Alternative 2A: Proposed Action at the southern boundary of the unit along U.S. Highway 28. The unit is extremely remote and undeveloped. Although the landscape shows little topography, there are ample opportunities for solitude. Major human activities include heritage tourism, hunting, hiking, photography, and wildlife viewing. Some livestock grazing occurs in the unit (BLM 2011b). This unit was inventoried in 2011; management of the lands with wilderness characteristics units has not been analyzed through a land-use planning process. The implementation of Alternative 2A: Proposed Action would result in the crossing of a small portion of the unit at the southern boundary for approximately 0.9 mile. The unit would be crossed by the pipeline at

about 0.6-mile north of the southern boundary. Potential impacts on this unit could include limitation on future management options. Detailed analysis of these management options would be considered during the land-use planning process and the update to the Rock Springs RMP (anticipated to be completed in 2019).

Also, the pipeline would remove 131.7 acres from the contiguous unit. The remaining size of the unit would be reduced to 7,882.7 acres, which would be above the 5,000-acre size requirement. The short-term effects on the naturalness, solitude, and unconfined/primitive recreation of the area would include visual, noise, dust, and vehicle emissions from construction activities and equipment. Access to the remaining portion of the North Pacific Creek unit would not be affected. Long-term effects from the Project would include influencing the area's wilderness characteristics along the southern edge of the unit. However, the use of solar power at the MLVs or the burial of distribution lines, or both, would be employed to limit these long-term impacts on solitude and human presence from Project infrastructure. Design features of the Proposed Action and agency-required mitigation measures would be applied as appropriate to address resources for which the area is managed. Refer to Sections 4.3.9.4, 4.3.13, and 4.3.19 for discussion of impacts related to noise, recreation, and visual resources that may be related to use of lands with wilderness characteristics.

Mowing Machine Draw (Unit WY040-2011-069) is located adjacent to Alternative 2A: Proposed Action at the southern boundary of the unit along County Road 21 (Bar X Road). The southern portion of this unit is considered to be relatively pristine with outstanding opportunities for primitive and unconfined recreation. Vegetation is predominantly sagebrush steppe. Major human activities include hunting, hiking, wildlife viewing, and photography. Some livestock grazing also occurs in the unit (BLM 2011c). This unit was inventoried in 2011; management of the lands with wilderness characteristics units has not been analyzed through a land-use planning process. Short-term Project effects on the naturalness and solitude/unconfined and primitive recreation of the area would be related to visual resources, noise, and dust and vehicle emissions from construction activities and equipment, as well as potential restrictions on access to the inventoried area during construction. Long-term impacts from location of the proposed pipeline along the existing county road would not affect the size, naturalness, or solitude of the area or change permanent access to unconfined recreation. Design features and agency-required mitigation measures would be applied as appropriate to address resources for which the area is managed. In addition, the pipeline would be micro-sited to avoid encroachment into the inventoried unit boundary. Refer to Sections 4.3.9.4, 4.3.13, and 4.3.19 for discussion of impacts related to noise, recreation, and visual resources that may be related to use of lands with wilderness characteristics.

Bush Creek (Unit WY040-2011-074) is located adjacent to Alternative 2A: Proposed Action at the southern boundary of the unit. The proposed pipeline would be located at the southern boundary of the unit along County Road 21 (Bar X Road). The area is considered to be extremely remote and consists of sufficient topography to shield users from other users. Vegetation is predominantly sagebrush steppe. Major human activities include hunting, hiking, photography, and wildlife viewing (BLM 2011d). This unit was inventoried in 2011; management of the lands with wilderness characteristics units has not been analyzed through a land-use planning process. Short-term Project effects on the naturalness and solitude/unconfined and primitive recreation of the area would be related to visual resources, noise, dust and vehicle emissions from construction activities and equipment, as well as potential restrictions on access to the inventoried area during construction. Long-term impacts from location of the proposed pipeline along the existing county road would not affect the size, naturalness, or solitude of the area or change permanent access to unconfined recreation. Design features and agency-required mitigation measures would be applied as appropriate to address resources for which the area is managed. In addition, the pipeline would be micro-sited to avoid encroachment into the inventoried unit boundary. Refer to Sections 4.3.9.4, 4.3.13, and 4.3.19 for discussion of impacts related to noise, recreation, and visual resources that may be related to use of lands with wilderness characteristics.

Short-term indirect impacts on both WY040-2011-069 and WY040-2011-074 would cease once the construction period is complete. Long-term impacts are not anticipated since reclamation activities would address mitigation of impacts on resources for which the area is managed and would return the area to its original primitive state. Refer to Sections 4.3.9.4 and 4.3.19 for discussion of impacts related to noise, recreation, and visual resources that may be related to use of lands with wilderness characteristics.

Alternative 2B: Southern Route does not cross any lands with wilderness characteristics units; thus, there would be no identifiable impacts on lands with wilderness characteristics along this alternative route.

4.3.10.5.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

There would be no identifiable impacts from construction, operation, or maintenance of the Project on lands with wilderness characteristics from the pipeline in Segment 3. Using the boundaries identified in coordination with the Casper Field Office, it was determined that subunit 2 would be the only portion of Square Top Butte that would be crossed by the Project right-of-way. Right-of-way WYW 0200659 forms the western boundary of this subunit, cutting it off from the greater Square Top Butte unit. Because subunit 2 is 880 acres, it does not meet the 5,000-acre size requirement and is found not to have wilderness character. The Project does not cross the remaining portion of the Square Top Butte Unit. Therefore, there would be no long-term impacts on lands with wilderness characteristics from the proposed pipeline within Segment 3. Potential short-term impacts on the remaining portion the Square Top Butte Unit may be related to visual, noise, dust and vehicle emissions but would cease once the construction period is complete.

4.3.10.5.4.1 230-Kilovolt Transmission Line

There are no lands with wilderness characteristics crossed by the proposed 230kV line. Therefore, there would be no identifiable impact from construction, operation, or maintenance of the Project on lands with wilderness characteristics from the proposed 230kV transmission line.

4.3.10.5.4.2 Mainline Valve Distribution Lines

The impacts associated with the addition of distribution lines through WY040-2011-059 and near WY040-2011-069 and WY040-2011-074 could be minimized through use of solar powered MLVs. The Applicant has committed to the use of solar power in sensitive areas, such as lands with wilderness characteristics units, which would eliminate the need for power poles and overhead power lines that would otherwise affect solitude and evidence of human presence in the area.

4.3.10.6 Summary Comparison of Alternative Routes

Only Alternative 2A: Proposed Action would affect lands with wilderness characteristics. However, the removal of 131.7 acres from the contiguous unit WY040-2011-059 would not affect the long-term management of the remaining acreage (7,882 acres).

4.3.11 Paleontological Resources

4.3.11.1 Issues Identified for Analysis

The potential for direct or indirect impact on paleontological resources was raised during agency scoping.

4.3.11.2 Types of Potential Effects

The construction, operation, and maintenance of the Project could result in both direct and indirect adverse effects on paleontological resources. Potential direct effects associated with construction activities could include the loss of paleontological resources as a result of ground-disturbing activities,

such as excavation, blasting, and construction of facilities and staging areas, and road construction or improvement. Potential direct effects associated with the operation and maintenance of the facilities and the presence of the pipeline would not be anticipated.

Indirect effects associated with the construction, operation, and maintenance of the Project could include loss of paleontological resources resulting from increases in the following:

- Potential for increased access of the public to previously inaccessible areas, resulting in the unauthorized collection or vandalism of paleontological resources
- Erosion associated with construction activities, which exposes new fossils

Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.11.3 Criteria for Assessing Intensity of Impacts

Criteria for assessing the relative sensitivity of paleontological resources associated with each geologic unit that could be affected by the Project include a review of geological and paleontological literature and the PFYC. Mitigation of potentially adverse impacts on scientifically significant paleontological resources exposed during construction-related activities would be based on the determination of PFYC for each geologic unit and implementation of prescribed treatments where PFYCs are determined to be very high, or high or moderate, or during other specific cases (e.g., chance discoveries of paleontological resources in areas with low sensitivity). The PFYC system has five classes (1 through 5) based on the potential of a geologic unit to produce fossils. A summary of these classes is included below:

- **Class 1. Very Low Potential**. Geologic units that are not likely to contain recognizable fossil remains. These units include igneous, metamorphic, and Precambrian rocks.
- **Class 2. Low Potential**. Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils. These units include Aeolian, diagenetically altered, and Holocene sediments.
- **Class 3. Moderate or Unknown Potential**. Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential. Class 3 is divided into two parts:
    - **Class 3a. Moderate Potential**. Units are known to contain vertebrate fossils or scientifically significant nonvertebrate fossils, but these occurrences are widely scattered. Common invertebrate or plant fossils may be found in the area.
    - **Class 3b. Unknown Potential**. Units exhibit geologic features and preservational conditions that suggest significant fossils could be present, but little information about the paleontological resources of the unit or area is known. This may indicate the unit or area is poorly studied and field surveys may uncover significant fossils.
- **Class 4. High Potential**. Geologic units that contain a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented and may vary in occurrence and predictability.
- **Class 5. Very High Potential**. Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils.

4.3.11.4 Mitigation Planning

The loss of paleontological resources due to ground-disturbing activities during construction of the Project would be the primary potential adverse environmental effect. Initial impacts are those effects

resulting from the implementation of the Project, including implementation of design features of the Proposed Action for environmental protection (Table 2-18). The specific design features of the Proposed Action for environmental protection relevant to paleontological resources include:

- **Design Feature 15 (paleontological mitigation).** Requires development of a Paleontological Resources Treatment Plan to be incorporated into the POD, survey of pipeline route selected (minus areas previously surveyed), monitoring of ground-disturbing activities, and curation of paleontological resources in an approved repository.
- **Design Feature 17 (cultural and paleontological resources).** Applied in response to unexpected discoveries of paleontological resources during construction.

All ground-disturbing activities, including open trenches, will be monitored and inspected by a qualified paleontologist for paleontological resources along the portions of the Project having geologic units with a PFYC of 3, 4, or 5. Previously identified paleontological sites within the Project area will also require monitoring by a qualified paleontologist. Paleontological sites identified during pre-construction surveyswould be protected until the sites can be assessed, collected, or mitigated.

In addition, all blasting work would be conducted in compliance with federal, state, and local laws, rules, and regulations. The Contractor is responsible for obtaining permits to store blasting materials. Blasting will not occur without BLM approval regarding sensitive cultural and/or paleontological areas. Procedures and materials used would be identified in the blasting plan provided by the blasting contractor.

Residual impacts represent anticipated impacts on paleontological resources that would remain after implementation of agency-required mitigation measures (refer to Table 4-2). The level of potential residual impacts on paleontological resources associated with implementation of the Project is presented in Table 4-76. The agency-required mitigation measures that could be applied to avoid, reduce, or minimize impacts on paleontological resources include:

- **Agency-Required Mitigation Measure 1 (sensitive resource avoidance).** Applied where the Project would cross previously identified paleontological resources. The BLM may choose to cross and mitigate a paleontological resource rather than move the pipeline, due to other resources involved. This would be determined on a case-by-case basis.

4.3.11.5 Results (Direct and Indirect Residual Effects)

Table 4-76 identifies paleontological resources affected by the implementation of the Project and the initial and residual impacts.

Table 4-76
Paleontological Resources Inventory Data and Residual Impacts

Alternative Route	Total Miles	Resource Inventory (miles)					Residual Impacts (miles)[1]	
		PFYC 1	PFYC 2	PFYC 3	PFYC 4	PFYC 5	None	Low
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant								
1A: Proposed Action	30.4	3.6	3.7	0.0	0.0	23.1	0.0	30.4
1A Variation: Dry Basin Draw	30.7	2.3	3.7	0.0	0.0	24.7	0.0	30.7
1B: Dry Piney	34.5	2.9	4.1	0.0	0.0	27.5	0.0	34.5
1C: Figure Four	38.5	3.9	2.9	0.0	0.0	31.7	0.0	38.5

Table 4-76
Paleontological Resources Inventory Data and Residual Impacts

Alternative Route	Total Miles	Resource Inventory (miles)					Residual Impacts (miles)[1]	
		PFYC 1	PFYC 2	PFYC 3	PFYC 4	PFYC 5	None	Low
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect								
2A: Proposed Action	129.1	9.2	9.9	16.7	4.3	89.0	0.0	129.1
2B: Southern Route	136.2	24.0	12.0	22.2	4.3	73.7	0.0	136.2
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect								
3A: Proposed Action	83.2	4.2	13.5	33.5	0.4	31.6	0.0	83.2
3B: Lost Creek to Lost Cabin	73.0	10.7	15.7	19.8	0.0	26.8	0.0	73.0
3C: Lost Creek to Highway 20/26	101.4	25.4	15.3	23.3	0.0	37.4	0.0	101.4

NOTE: [1]With the implementation of agency-required mitigation measures identified for this resource, no high or moderate impacts would be anticipated

4.3.11.5.1 Potential Fossil-Bearing Geologic Formations

4.3.11.5.1.1 No Action Alternative

Under the No Action Alternative, the right-of-way grant on BLM-administered lands would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.11.5.1.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction and Injection Wells

Any ground disturbance in these geologic units could result in the loss of paleontological resources. As part of the design features of the Proposed Action for environmental protection, paleontological monitors would be present during construction activities in areas having PFYCs of 5. The implementation of this mitigation would minimize the impacts on paleontological resources present.

Segment 1 Pipeline Alternative Routes

Alternative 1A: Proposed Action crosses 23.1 miles of geologic units having a PFYC of 5 (very high). These geologic units include the Laney Shale Member of the Green River Formation, New York Tongue of the Wasatch Formation, Fontenelle Tongue of the Green River Formation, Green River and Wasatch Formations, LaBarge and Chappo Members of the Wasatch Formation, and Diamictite and Sandstone of the Wasatch Formation. Fossil turtle and crocodile remains and clam molds were found during previous paleontological surveys for Segment 1 (Erathem-Vanir 2012). Any ground disturbance in these geologic units could result in the loss of paleontological resources. As part of the design features of the Proposed Action for environmental protection, paleontological monitors would be present during construction activities in areas having PFYCs of 5. The implementation of this mitigation would minimize the impacts on paleontological resources, reducing all residual impacts to low.

Compared to Alternative 1A: Proposed Action, Alternative 1A Variation: Dry Basin Draw crosses 1.6 more miles of geologic units having a PFYC of 5; Alternative 1B: Dry Piney crosses 4.4 more miles of geologic units having a PFYC of 5; and Alternative 1C: Figure Four crosses 8.6 more miles of geologic units having a PFYC of 5.

4.3.11.5.1.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Alternative 2A: Proposed Action crosses 89.0 miles of geologic units having a PFYC of 5. These include the White River Group, Laney Shale, Wilkins Peak, and Tipton Shale members and Fontenelle Tongue of the Green River Formation; the Cathedral Bluffs Tongue and Main Body of Wasatch Formation; and the Bridger Formation. Alternative 2A: Proposed Action also crosses 4.3 miles of a geologic unit having a PFYC of 4. This unit is the transitional unit between the Battle Spring Formation and the Wasatch Formation. Additionally, Alternative 2A: Proposed Action crosses 16.7 miles of geologic units having a PFYC of 3. These units include Miocene Rocks, the Bridger Formation, the Battle Spring Formation, the Fort Union Formation, and the Almond Formation of the Mesaverde Group. Fossil reptilian and gar remains, and petrified wood were found during a previous paleontological survey along Segment 2 (Erathem-Vanir 2012). Any ground disturbance in these geologic units could result in the loss of paleontological resources. As part of the design features of the Proposed Action for environmental protection, paleontological monitors would be present during construction activities in areas having PFYCs of 3, 4, and 5. The implementation of this mitigation would minimize the impacts on paleontological resources present.

Alternative 2B: Southern Route crosses 16.7 fewer miles of geologic units having a PFYC of 5, the same number of miles for geologic units having a PFYC of 4, and 6.5 more miles of geologic units having a PFYC of 3 than Alternative 2A: Proposed Action.

4.3.11.5.1.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Alternative 3A: Proposed Action crosses 31.6 miles of geologic units having a PFYC of 5. These geologic units include the White River Formation, Wind River Formation, Cloverly Formation, Morrison Formation, and Sundance Formation and the combined mapped unit with the Lance Formation, Fox Hills Sandstone, Meeteetse Formation, and Bearpaw and Lewis Shales. Alternative 3A: Proposed Action also crosses 0.4 mile of geologic units having a PFYC of 4, which is the transition unit between the Battle Spring Formation and Wasatch Formation. Alternative 3A: Proposed Action would also affect 33.5 miles of geologic units having a PFYC of 3. These geologic units include the Miocene Rocks, the Battle Spring Formation, the Fort Union Formation, the Frontier Formation, the Mesaverde Group, Cody Shale, Mowry and Thermopolis Shales, and the Chugwater and Dinwoody formations, as well as the combined mapped unit with the Meeteetse Formation and Lewis Shale. Fossil turtle and petrified wood were found during a previous paleontological survey for Segment 3 (Erathem-Vanir 2012). Any ground disturbance in these geologic units could result in the loss of paleontological resources. As part of the design features of the Proposed Action for environmental protection, paleontological monitors would be present during construction activities in areas having PFYCs of 3, 4, or 5. The implementation of this mitigation would minimize the impacts on paleontological resources, reducing all residual impacts to low.

Alternative 3B: Lost Creek to Lost Cabin crosses 4.8 fewer miles of geologic units having a PFYC of 5, 0.4 fewer miles of geologic units with a PFYC of 4, and 13.5 fewer miles of geologic units with a PFYC of 3 than Alternative 3A: Proposed Action.

Alternative 3C: Lost Creek to Highway 20/26 crosses 5.8 more miles of geologic units having a PFYC of 5, 0.4 fewer miles of geologic units with a PFYC of 4, and 10.2 fewer miles of geologic units with a PFYC of 3 than Alternative 3A: Proposed Action.

4.3.11.5.1.5 230-Kilovolt Transmission Line

The 230kV transmission line crosses the Laney Member of the Green Formation, but no previously reported fossil localities are known in the right-of-way. A paleontological survey would be conducted

prior to construction. Any findings would be addressed in the Paleontological Resources Protection Plan; thus, impacts on paleontological resources would be low.

4.3.11.5.1.6 Mainline Valve Distribution Lines

The MLV distribution lines are expected to result in temporary and permanent disturbance to geologic units with moderate to high PFYC. Without knowing the location of these distribution lines, the amount of impact resulting from construction of these distribution lines cannot be provided at this time. The poles for these lines are proposed to be approximately 250 feet apart and have a 20-foot by 20-foot temporary area of disturbance. It is estimated that there will be 1.1 miles of 12-foot-wide access road for every 1 mile of distribution lines. These access roads would be reclaimed.

The construction of above-ground poles would have less impact on paleontological resources than the alternative buried lines. The design features of the Proposed Action and agency-required mitigation measures would be followed for the distribution lines. A paleontological survey would be conducted prior to construction. Any findings would be addressed in the Paleontological Resources Protection Plan. The implementation of this mitigation would minimize the impacts on paleontological resources present.

4.3.11.6 Summary Comparison of Alternative Routes

In Segment 1, the potential for impacts on paleontological resources is similar among alternative routes, but Alternative 1C crosses more geologic units with a PFYC of 5. In Segment 2, Alternative 2A: Proposed Action crosses more geologic units with a PFYC of 5 than Alternative 2B: Southern Route. In Segment 3, Alternative 3C: Lost Creek to Highway 20/26 crosses geologic units with a PFYC of 5. However, through the application of Design Feature 15 and Design Feature 17 and Agency-Required Mitigation Measure 1, the impacts on paleontological resources would be minimized to the extent practicable.

4.3.12 Public Health and Safety

4.3.12.1 Issues Identified for Analysis

The following issues related to hazardous materials and public safety were identified during scoping:

- Adherence to the requirements for spill prevention and emergency response
- The potential for pipeline releases (e.g., H_2S) and the potential effects of any releases that would affect public health and safety
- The potential impacts on public health and safety in areas where H_2S is transported, removed, and/or re-injected
- The potential for conflict with existing previously contaminated sites

4.3.12.2 Types of Potential Effects

The federal, state, and local regulations, in addition to the Applicant's Hazardous Materials Management and Spill Prevention, Control, and Countermeasure Plan, are in place to ensure that public health and safety is protected. The types of effects that could occur from the construction, operation, and maintenance of the Project include inadvertent release of hazardous materials that could cause potential contamination of soils and surface water and groundwater sources and release of gas into the atmosphere that would affect public health and safety. Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.12.3 Criteria for Assessing Impacts

The impact analysis for public health and safety differs from other resources in that high, moderate, and low were not used to quantitatively assess the level of impacts, as was done for most other resources. Instead, qualitative analysis was conducted to identify whether impacts on public health and safety would occur at a high, moderate, or low level.

4.3.12.4 Mitigation Planning

Initial impacts are those effects resulting from the implementation of the Project, including implementation of design features of the Proposed Action for environmental protection (Table 2-18). The specific design features of the Proposed Action for environmental protection relevant to public health and safety include:

- **Design Feature 25 (waste management disposal).** Applied to ensure that wastes would be properly containerized and removed periodically for disposal at appropriate off-site permitted disposal facilities.
- **Design Feature 26 (waste management wastewater).** Applied to any wastewater generated in association with temporary, portable sanitary facilities to ensure that the wastewater is disposed of in accordance with applicable state and local laws and regulations.

4.3.12.5 Results (Direct and Indirect Residual Effects)

4.3.12.5.1 No Action Alternative

Under the No Action Alternative, the right-of-way grant on BLM-administered lands would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.12.5.2 Effects Common to All Alternative Routes

The risk to public health and safety from the Proposed Action and all alternative routes would be low. The potentially hazardous materials used in pipeline and distribution line construction, and in the operation and maintenance of equipment and vehicles, (e.g., adhesives, solvents, etc.) are consumed in small volumes. Substantial accumulation of hazardous wastes at the construction site is not anticipated. Remaining hazardous wastes from material usage and equipment maintenance will be removed from the construction site during and at the close of the construction mobilizations. Proper handling, storage, and disposal of hazardous wastes are required by federal regulations and these procedures will avoid direct effects on air, land, and water resources associated with improper management of hazardous construction-related wastes. Design Features 26 and 27, as well as procedures identified in the Hazardous Materials Management and Spill Prevention, Control, and Countermeasure Plan in Appendix K of the POD and the Emergency Response Plan in Appendix M of the POD (Appendix A), will further reduce risk of accidental contamination during construction, operation, or maintenance of the Project.

The nongaseous H_2S/CO_2 pipeline and the CO_2 pipeline would be designed in accordance with the USDOT Pipeline Safety Regulations, 49 CFR 192. Potential effects of an inadvertent release would include potential contamination at the spill site and potential risk to human health. CO_2 has a vapor density of 1.53 (air equals 1.0) such that if released in large volumes, it has the potential to occupy topographically low areas. Therefore, the severity impacts from a spill or leak would depend on the weather conditions, location of the event, topography of the contamination site, and proximity to sensitive receptors.

The topography of the Project area consists of rolling hills, plateaus, and isolated mountain ranges. Mitigation Measure 1 would be applied to implement micro-siting or avoidance of sensitive receptors,

such as wetland areas, special status plant or wildlife habitat areas, and water crossings. Avoidance of these resources would greatly reduce the effects associated with an accidental pipeline leak by physically separating the pipeline from these sensitive receptors. In addition, because all three segments of the Project cross through sparsely populated areas, the risk to human health and safety from a leak or spill would be low.

The implementation of SCADA leak detection technology would further reduce potential impacts of any accidental leak along the pipeline. The SCADA communication technology sites would be located approximately every 4 miles. In the unlikely event of a pipeline accident, the Applicant would be able to remotely activate the motorized block values therefore isolating the affected segment within minutes of the detection. Local personnel will be available to respond immediately to an emergency to implement response methods identified in Appendix K of the POD (Appendix A).

Impacts on fire hazard and emergency response would be low. Any potential impacts would be minimized through the application of standard operating procedures and BMPs identified in the Hazardous Materials Management and Spill Prevention, Control, and Countermeasure Plan (Appendix K of the POD); the Emergency Response Plan (Appendix M of the POD); and the Reliability, Safety, and Transportation Resource Report (included in Appendix A). As described in Section 2.2.1.1, the injection wells and plant facilities are designed to prevent leakage or seeping in to aquifers and potentially useful groundwater zones.

The Project would not cross any existing previously contaminated hazardous material sites within the RRNP study area. A review of EPA Region 8 Superfund Site Status Summaries for Wyoming, as well as the CERCLIS database, shows no Superfund sites intersected by the proposed pipeline route (EPA 2015b). The Hazardous Materials Management and Spill Prevention, Control, and Countermeasure Plan in Appendix K of the POD (Appendix A) will be followed if unexpected contaminated sites are encountered.

4.3.12.5.3 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

4.3.12.5.3.1 Riley Ridge Sweetening Plant Construction

The proposed location for the Riley Ridge Sweetening Plant is approximately 10 miles from the nearest populated areas of LaBarge and Big Piney, Wyoming. The isolated nature of the proposed Riley Ridge Sweetening Plant reduces the potential for impacts on the public if there is an inadvertent release or spill. Proper handling and transport of wastes associated with operation and maintenance will serve to avoid indirect effects on air, land, and water associated with improper management of nonhazardous construction-related wastes. In the event of an inadvertent release of CO_2 or H_2S during transport, removal, or reinjection, the Emergency Response Plan outlined in Appendix M of the POD (included in Appendix A of this EIS) would be implemented.

4.3.12.5.3.2 Injection Wells

Potential impacts from the injection wells would be the same as those discussed above for the proposed Riley Ridge Sweetening Plant.

4.3.12.5.3.3 Segment 1 Pipeline Alternative Routes

For all alternative routes in Segment 1, the proposed location for the Green River crossing is approximately 10 miles from the nearest populated areas of LaBarge and Big Piney, Wyoming. The isolated nature of the proposed Green River crossing reduces the potential for impacts on the public and natural resources if there is an inadvertent release or spill. In the event of an inadvertent release of CO_2 or

H_2S during transport, the Emergency Response Plan outlined in Appendix M of the POD (Appendix A) would be implemented. In addition, use of the SCADA leak detection communication technology would result in immediate notification and response to a leak along all alternative routes. Adherence to the Applicant's Hazardous Materials Management and Spill Prevention, Control, and Countermeasure Plan in Appendix K of the POD and the Emergency Response Plan in Appendix M of the POD (Appendix A) would further reduce any potential for impacts on public health and safety.

Impacts on public health and safety would not be anticipated to occur from construction, operation, or maintenance of the Project along the route of Alternative 1A: Proposed Action or any of the alternative pipeline routes in Segment 1. Application of design features would serve to site the proposed pipeline away from sensitive resources and ensure that waste generated from construction, operation, and maintenance of the proposed pipeline is properly removed.

Impacts on local or regional fire hazard and emergency response would not be anticipated from Alternative 1A: Proposed Action or any of the other proposed alternative routes in Segment 1. Alternative 1A: Proposed Action and other proposed alternative routes in Segment 1 do not cross any previously contaminated hazardous material sites within the study area. Adherence to the Applicant's Emergency Response Plan in Appendix M of the POD and the Reliability, Safety, and Transportation Report included in Appendix A of the POD (Appendix A) would result in immediate response to any spills or leak to minimize impacts from hazardous materials or fire.

4.3.12.5.4 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

For Alternative 2A: Proposed Action and all alternative routes in Segment 2, impacts on public health and safety would be the same as those discussed for Segment 1. No impacts on public health and safety would occur from the proposed Riley Ridge Treatment Plant in this portion of the study area.

Impacts on fire hazard and emergency response for Alternative 2A: Proposed Action and all alternative routes in Segment 2 would be the same as those discussed for Segment 1.

4.3.12.5.5 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

For all alternative routes in Segment 3, impacts on public health and safety would be the same as those discussed for Segment 1. No impacts on public health and safety would occur from the proposed Riley Ridge Treatment Plant in this portion of the study area.

Impacts on fire hazard and emergency response for all alternative routes in Segment 3 would be the same as those discussed for Segment 1.

4.3.12.5.6 230-Kilovolt Transmission Line

The proposed alignment for the 230kV lines does not cross any residential, commercial, or industrial development. Due to the undeveloped nature of the Project area, there would be no identifiable impacts associated with public health and safety from the proposed 230kV line.

4.3.12.5.7 Mainline Valve Distribution Lines

Due to the undeveloped nature of the Project area, there would be no identifiable impacts associated with public health and safety from the proposed distribution lines. If conflicts arise during final design, impacts could be minimized by use of solar power at MLVs or by burial of lines.

4.3.12.6 Summary Comparison of Alternative Routes

Impacts from the proposed pipeline would be the same across all alternative routes in all segments.

4.3.13 Recreation

4.3.13.1 Issues Identified for Analysis

The issues identified during the scoping process include potential impacts on:

- Recreation management areas and other areas used for recreation, including the potential effects of the introduction of noxious and invasive weeds on recreation
- Recreational hunting opportunities

4.3.13.2 Types of Potential Effects

The construction, operation, and maintenance of the Project could result in direct and indirect effects on recreation resources, including:

- Temporarily reduced access to recreation areas and hunting grounds during construction (No permanent road closures are anticipated. Recreational areas will be avoided where possible.)
- Increased opportunities for the introduction and spread of noxious and invasive weeds in recreation areas and along improved access roads
- Potential diminished recreation experiences as a result of permanent disturbance, such as the addition of substation and MLV in recreation areas
- Increased long-term access into hunting grounds as a result of improved access roads

Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.13.3 Criteria for Assessing Impacts

Criteria used for assessing impacts on recreation are described in Table 4-77.

Table 4-77
Criteria for Assessing Level of Impacts on Recreation

Level of Impacts	Description
High	▪ Areas where the Project would conflict physically and/or create a direct, long-term conflict with existing recreation (e.g., removal of land used for recreation [i.e., use area or campground]) ▪ Areas where the Project would conflict with any applicable adopted management prescription or goal of the affected land-management agency (e.g., SRMAs)
Moderate	▪ Areas where the Project would create a direct (short-term) and/or indirect (short- or long-term) conflict with a recreation use (e.g., introduction of noise and/or limiting access to hunting areas or introduction or spread of invasive weeds)
Low	▪ Areas where the Project would create a direct (short-term) and/or indirect (short- or long-term) conflict with existing recreation uses and/or management ▪ Areas where the Project would be compatible with recreation uses

4.3.13.4 Mitigation Planning

Residual impacts represent anticipated impacts on recreation resources that would remain after implementation of agency-required mitigation measures (refer to Table 4-2). The level of potential residual impacts on recreation resources associated with implementation of the Project was assessed using the criteria presented in Table 4-77. The agency-required mitigation measures applied to avoid, reduce, or minimize impacts on recreation resources include:

- **Agency-Required Mitigation Measure 1 (sensitive resource avoidance).** Implemented to avoid a sensitive resource or sensitive sites.
- **Agency-Required Mitigation Measure 6 (minimizing tree clearing).** Implemented to recreation sites and non-motorized trails to reduce impacts on the recreation experience.
- **Agency-Required Mitigation Measure 8 (interim and intense reclamation).** Applied to promote re-establishment of vegetation communities, return the area to its natural state, and address visual resources to reduce impacts on recreation experiences.

Table 4-78 summarizes the initial impacts on recreation, the agency-required mitigation measure or measures applied to mitigate potentially adverse effects on those resources, and the remaining residual impacts. Section 4.3.13.5 reports on the high and moderate residual impact mileages that would occur after agency-required mitigation is applied.

Table 4-78
Summary of Initial and Residual Impacts on Recreation Resources

Resource[1]	Initial Impact	Agency-Required Mitigation Measure	Residual Impact[2]
Recreation Site	Moderate	1, 6, 8	Low
Recreation Trail (hiking, biking, equestrian)	Moderate	1, 6, 8	Low
Trail-Historic	High	1, 6, 8	Moderate
OHV/Motorized Use Area	Low	Not applicable	Low

NOTES:
[1]ERMAs, SRMAs, and ROS were not analyzed quantitatively and, therefore, were not included in this table.
[2]Initial impacts reflect implementation of the design features of the Proposed Action for environmental protection, which are considered to be part of the Applicant's Project description (and include the Applicant-committed measures [Appendix A]). Residual impacts reflect the anticipated effects that would remain after implementation of agency-required mitigation measures.

4.3.13.5 Results (Direct and Indirect Residual Effects)

A summary of miles of each impact level by alternative route are described in Table 4-79.

4.3.13.5.1 Recreation Areas

4.3.13.5.1.1 No Action Alternative

Under the No Action Alternative, a right-of-way grant on BLM-administered lands would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.13.5.1.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction and Injection Wells

No recreation facilities are located at the proposed injection wells. Therefore, no impacts from construction or operation are anticipated.

Table 4-79
Recreation Resources Inventory Data and Residual Impacts

Alternative Route	Total Miles	Resource Inventory (miles)									Residual Impacts (miles)[2]		
					Recreation Opportunity Spectrum[1]								
		Recreation Trail	Off-Highway Vehicle	Extensive Recreation Management Area[1]	Roaded Natural	Rural	Semiprimitive Motorized	Semiprimitive Non-motorized	Scenic Byway/Backway[1]	Special Recreation Management Area[1]	None	Low	Moderate
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant													
1A: Proposed Action	30.4	0.0	19.2	0.0	0.5	7.2	0.0	0.0	0.0	1.0	11.2	19.2	0.0
1A Variation: Dry Basin Draw	30.7	0.0	19.5	0.0	0.5	7.2	0.0	0.0	0.0	1.0	11.2	19.5	0.0
1B: Dry Piney	34.5	0.0	18.8	0.0	0.5	7.2	0.0	0.0	0.0	1.0	15.7	18.8	0.0
1C: Figure Four	38.5	0.0	23.2	0.0	1.3	8.2	0.0	0.0	0.0	0.0	15.3	23.2	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect													
2A: Proposed Action	129.1	0.1	30.0	29.0	14.6	36.9	44.6	0.0	39.7	6.2	99.0	30.1	0.0
2B: Southern Route	136.2	0.1	30.1	29.0	6.2	74.9	22.2	0.5	5.2	6.2	106.0	30.2	0.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect													
3A: Proposed Action	83.2	0.0	0.0	28.8	0.0	0.0	0.0	0.0	0.0	13.5	82.9	0.0	0.0
3B: Lost Creek to Lost Cabin	73.0	0.0	0.0	49.6	0.0	0.0	0.0	0.0	0.0	13.5	73.0	0.0	0.0
3C: Lost Creek to Highway 20/26	101.4	0.0	0.0	44.3	0.0	0.0	0.0	0.0	0.1	13.5	101.1	0.0	0.0

NOTES:
[1]Residual impacts are not associated with the resource inventory, but will be discussed qualitatively.
[2]With the implementation of agency-required mitigation measures identified for this resource, no high impacts would be anticipated.

Segment 1 Pipeline Alternative Routes

Alternatives 1A: Proposed Action, 1A Variation: Dry Basin Draw, and 1B: Dry Piney cross 1 mile of the Green and New Fork Rivers-Lower Zone SRMA.

The Green and New Fork Rivers-Lower Zone SRMA is part of the Middle Country Zone in the Pinedale Field Office RMP and is available for fluid mineral leasing. However, no surface disturbance is allowed within 0.25 mile on either side of the river. The Applicant has committed to conducting HDD as mitigation in this area. Geotechnical samples will be required to determine the subsurface for the horizontal directional drill, and this will be done prior to construction. A depth of 30 feet would be the minimum depth for the drill, which would have no surface disturbance within the 0.25 mile-restriction area on either side of the Green River. In addition to the information above, the targeted outcome activities for this recreation area are float and wade fishing, hunting, family and group camping, float camping, and wildlife viewing. These activities would be temporarily disrupted because of Project construction. Additionally, long-term effects include improved access roads; a potential increase in the number of users of the area; and a reduction in opportunities for remote recreation experiences, including hunting, camping, and wildlife viewing. The potential for establishment of invasive species in the management area within vegetation communities known to be susceptible to invasion of noxious weeds and invasive species (such as sagebrush communities) and riparian corridors could potentially be altered and, therefore, affect the long-term recreation experience by altering the natural surroundings. However, agency-required mitigation measures would be applied in these areas and residual impacts would be low. For additional discussion related to noxious weeds and invasive species, refer to Section 4.3.18.5.3.

Effects on hunting would typically occur during construction of the Project and during maintenance if these activities were to occur during hunting season. Potential direct short-term effects could include disturbance of game and a temporary precluding of access during hunting season. Long-term effects on hunting include potential disturbance of game during operations and maintenance if those activities occurred during hunting season.

Alternative 1C: Figure Four does not cross and, thus, would not affect any recreation areas.

Two recreation sites (North and South Long Island Green River walk-in fishing access) are in the 2-mile-wide study corridor in Segment 1 for Alternatives 1A: Proposed Action, 1A Variation: Dry Basin Draw, and 1B: Dry Piney though the sites would not be crossed by the permanent right-of-way.

The closest recreation site (the South Long Island Green River walk-in fishing access) is approximately 800 feet from the Project permanent right-of-way. Impacts on this fishing access would be moderate and would include short-term direct effects, including diminished access to the sites during construction. Long-term direct effects would include potential improved vehicular access to the sites. Additionally, potential long-term effects include diminished recreation experience depending on the locations of permanent surface disturbance. The potential for the introduction or spread of noxious weeds and invasive species from construction activities could alter vegetation along the riparian corridor (including salt cedar [*Tamarix*]) and eventually could reduce access to the river for fishing. However, design features of Proposed Action and agency-required mitigation measures used, such as HDD, would reduce surface disturbance and minimize the introduction and spread of infestations. Refer to Section 4.3.18.4 for further discussion of mitigation measures that would reduce impacts on vegetation.

4.3.13.5.1.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Alternatives 2A: Proposed Action and 2B: Southern Route cross 29 miles of ERMAs in Segment 2, including the:

- Lander Field Office ERMA (13.6 miles)
- Green Mountain ERMA (2.5 miles)
- CDNST ERMA (0.6 mile)
- Western ERMA (11.8 miles)

The Lander Field Office has designated all lands that are not within an identified SRMA or separate ERMA as the Lander Field Office ERMA. Its management focus is to provide extensive and unstructured types of recreation activities. Both alternative routes in this segment would use the Frontier Right-of-Way corridor in the Lander Field Office for 20.6 miles, which permits below-ground utilities only. Therefore, the BLM assumes no above-ground facilities would be placed in this corridor. Impacts on management of this ERMA would be low, as the pipeline would be in an area compatible with its use.

The Green Mountain ERMA recreation values include maintaining recreation sites, national and regional trails, local system trails, trailheads, and interpretive sites. The ERMA is open to major and minor rights-of-way but is subject to limitations, such as big game hunting seasons (September 1 through November 15), protection of visitor safety, and avoiding subjecting visitors to the sights and sounds of industrial development. All alternative routes cross the Green Mountain ERMA and would be completely in the Lander Field Office Frontier Right-of-Way corridor. Because Frontier permits below-ground utilities only, the BLM assumes that no above-ground facilities would be placed in the management area or these corridors. Therefore, impacts would be compatible with the management in this portion of the ERMA and would be low.

The CDNST ERMA is managed to limit recreation-use impacts, ensure visitor safety, reduce recreation conflicts, and support the nature and purpose of the CDNST. All alternative routes cross the CDNST ERMA in the Lander Field Office Frontier Right-of-Way corridor, so impacts on the management of the ERMA would be low. Because Frontier permits below-ground utilities only, the BLM assumes no above-ground facilities would be placed in the management area.

The Western ERMA management objectives are to provide for the health and safety of visitors, prevent or mitigate resource damage resulting from recreation uses, and minimize conflicts and adverse impacts on recreation opportunities. Provided there is adequate reclamation, buried utilities are allowed. Above-ground facilities must be avoided unless adequately mitigated to protect the viewshed. To comply with the management objectives of the Western ERMA, the BLM assumes no above-ground facilities would be placed in the management area. For both alternative routes, impacts associated with recreation resources would be short-term and low, as construction would cause temporary disturbance, potentially affecting views and access. For additional discussion related to impacts on visual resources, refer to Section 4.3.19.5.

Residual impacts on vegetation and hunting would be the same for Segment 2 as the impacts discussed for Segment 1.

Alternatives 2A: Proposed Action and 2B: Southern Route cross 6.1 miles of SRMAs in Segment 2, including the:

- Oregon Mormon Pioneer California SRMA (less than 0.1 mile)
- CDNST SRMA (6.0 miles)

The Oregon Mormon Pioneer California SRMA management objectives are to protect the quality of cultural, natural, and historic values and to protect certain trail corridors in their natural condition so as to provide for outdoor recreation and public use. Right-of-way crossings may be made with stipulations governing exact crossing and restoration procedures. For both alternative routes in Segment 2, impacts associated with recreation resources would be short-term and moderate, as construction would cause temporary disturbance potentially affecting access to the area and disrupting the recreation experience through noise, dust, etc. Mitigation measures would be applied for impacts on individual resources and are discussed in each resource section.

The CDNST SRMA is managed for long-term protection of recreation outcomes and settings. Recreation values include cultural site visitation, photography, horseback riding, hiking, hunting, and mountain biking. Both alternative routes cross the SRMA in the Lander Field Office Frontier right-of-way corridor, crossing in an area compatible with their use and having low impacts on the management of the area. This corridor allows below-ground utilities only; therefore, the BLM assumes that no above-ground facilities would be placed in this corridor. Short-term direct impacts on the recreation values of the management area would occur from construction and restoration activities and could affect users' access to the area.

Though not crossed by either alternative, the Killpecker Sand Dunes SRMA is within the Alternative 2B: Southern Route 2-mile-wide study corridor and manages for OHV use in an open-play fashion. Effects on this area would be short-term and indirect, as parking for this recreation area is on the south side of the SRMA and access to this parking could be precluded temporarily.

4.3.13.5.1.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Alternative 3A: Proposed Action crosses 28.8 miles of ERMAs in Segment 3, including the:

- Lander Field Office ERMA (25.1 miles)
- Green Mountain ERMA (2.5 miles)

The Lander Field Office ERMA's management focus is to provide extensive and unstructured types of recreation activities. This alternative would use the Lander Field Office Lost Creek right-of-way corridor, which permits above- and below-ground utilities in portions of the corridor and permits only below-ground rights-of-way development for portions of the corridor. It also would use the Lander Field Office Sand Draw to Casper right-of-way corridor, which permits above- and below-ground utilities. Impacts on management of this ERMA would be low, as the utility line would be in an area compatible for its use. In areas where only below-ground utilities are permitted, the BLM assumes that no permanent facilities will be placed above ground, and impacts would also be low.

The Green Mountain ERMA recreation values include maintaining recreation sites, national and regional trails, local system trails, trailheads, and interpretive sites. The ERMA is open to major and minor rights-of-way but is subject to limitations, such as big game hunting seasons (September 1 through November 15), protection of visitor safety, and avoiding subjecting visitors to the sights and sounds of industrial development. All alternative routes cross the Green Mountain ERMA and would be completely in the Lander Field Office Bairoil and Lost Creek right-of-way corridors. Lost Creek permits above- and below-ground utilities. The Bairoil right-of-way corridor permits below-ground utilities only; therefore, the BLM assumes that no above-ground facilities would be placed in the management area or this corridor. Accordingly, impacts would be compatible with the management in this portion of the ERMA and would be low.

Alternative 3A: Proposed Action crosses 12.7 miles of SRMAs in Segment 3, including the:

- CDNST SRMA (3.2 miles)
- NHTs Destination SRMA (9.5 miles)

The CDNST SRMA is managed for long-term protection of recreation outcomes and settings. Recreation values include cultural site visitation, photography, horseback riding, hiking, hunting, and mountain biking. Both alternative routes cross the SRMA in the Lander Field Office Bairoil and Lost Creek right-of-way corridor, crossing in an area compatible with their use and having low impacts on the management of the area. Lost Creek permits above- and below-ground utilities. The Bairoil right-of-way corridor permits below-ground utilities only; therefore, the BLM assumes that no above-ground facilities would be placed in this corridor. Short-term direct impacts on the recreation values of the management area would occur, as construction and restoration could affect users' access to the area.

The NHTs Destination SRMA is managed to identify and protect historic routes, remnants, and artifacts for public use and enjoyment. Both alternative routes cross the SRMA in the Lander Field Office Lost Creek right-of-way corridor, which permits above- and below-ground facilities. Therefore, impacts would be compatible with the management in this portion of the ERMA and would be low.

Alternative 3B: Lost Creek to Lost Cabin crosses 49.6 miles of ERMAs in Segment 3, which is 20.8 miles more than Alternative 3A: Proposed Action, including the:

- Lander Field Office ERMA (45.9 miles)
- Green Mountain ERMA (2.5 miles)

Impacts on these management areas would be similar to the impacts for Alternative 3A: Proposed Action, except that more miles of the Lander ERMA would be affected. This alternative would not use the Lander Field Office Sand Draw to Casper right-of-way corridor to cross the Lander ERMA but instead would continue in the Lander Field Office Lost Creek right-of-way corridor. This portion of the Lost Creek right-of-way-corridor is open to below-ground utilities only; therefore, the BLM assumes that no above-ground facilities would be placed in this corridor.

Alternative 3B: Lost Creek to Lost Cabin crosses 12.7 miles of SRMAs in Segment 3. Impacts on SRMAs for this alternative would be the same as the impacts discussed for Alternative 3A: Proposed Action.

Alternative 3C: Lost Creek to Highway 20/26 crosses 44.3 miles of ERMAs in Segment 3, including the:

- Lander Field Office ERMA (40.4 miles)
- Green Mountain ERMA (2.5 miles)

Impacts on these management areas would be similar to the impacts for Alternative 3A: Proposed Action, except that more miles of the Lander ERMA would be affected. This alternative would not use the Lander Field Office Sand Draw to Casper right-of-way corridor to cross the Lander ERMA but instead would continue in the Lander Field Office Lost Creek right-of-way corridor and then use the Lander Field Office Highway 20/26 right-of-way-corridor. This portion of the Lost Creek right-of-way-corridor is open to below-ground utilities only; therefore, the BLM that assumes no above-ground facilities would be placed in this corridor. The Highway 20/26 right-of-way corridor allows both above-ground and below-ground facilities. Therefore, impacts would be compatible with the management in this portion of the ERMA and would be low.

Alternative 3C: Lost Creek to Highway 20/26 crosses 12.7 miles of SRMAs in Segment 3. Impacts on SRMAs for this alternative would be the same as the impacts discussed for Alternative 3A: Proposed Action.

4.3.13.5.1.5 230-Kilovolt Transmission Line

No recreation management areas or sites are in the vicinity of the 230kV line transmission components; thus, no associated impacts would occur.

4.3.13.5.1.6 Mainline Valve Distribution Lines

In Segment 1, the Green and New Fork Rivers-Lower Zone permits above-ground facilities. Management of the SRMA is to provide wildlife habitat, support livestock grazing needs, control soil erosion, provide riparian stability, control noxious weeds, and protect special status species. Impacts on these resources are discussed in their respective sections.

In Segment 2, both alternative routes cross the Oregon Mormon Pioneer California SRMA and CDNST SRMA, in addition to the Lander Field Office ERMA, Green Mountain ERMA, CDNST ERMA, and the Western ERMA. Of these SRMAs and ERMAs, the Oregon Pioneer California SRMA, Western ERMA, and Green Mountain ERMA have limitations on rights-of way development. The Western ERMA is an avoidance area for above-ground facilities to protect the viewshed. Impacts on the management of these management areas could be minimized through burial of the distribution lines or by using solar power at the MLV. Burying the lines would eliminate the above-ground facilities, thereby permitting the distribution lines in the Western ERMA, protecting the viewshed. The remainder of the recreation management areas is managed for a variety of recreation activities, including photography, hiking, sightseeing, and cultural site visitations. Solar power or above-ground distribution lines may impair the recreational setting for these activities, while burying the lines would reduce impacts on the recreational setting.

In Segment 3, all alternative routes cross the Lander Field Office ERMA, the Green Mountain ERMA, the CDNST SRMA, and the NHTs Destination SRMA, in addition to the same SRMAs. Distribution lines would cross portions of these ERMAs and SRMAs in the Lander Field Office Lost Creek right-of-way corridor and the Bairoil right-of-way corridor in areas where above-ground facilities are not permitted. Compliance with management for these recreation management areas would require distribution lines to be buried or solar powered in these areas.

4.3.13.5.2 Recreation Trails

4.3.13.5.2.1 No Action Alternative

Under the No Action Alternative, a right-of-way grant on BLM-administered lands would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.13.5.2.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Neither Alternative 1A: Proposed Action nor any other alternative routes or route variations in Segment 1 cross recreation trails. Impacts on recreation trails would be the same as those discussed for the No Action Alternative. Impacts on NHTs are discussed under Section 4.3.7.

4.3.13.5.2.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Both alternative routes in Segment 2 cross the CDNST once for 0.1 mile. Impacts on recreation would be moderate and would include a temporary disruption of access during construction and an increase in

opportunity for the introduction and spread of noxious weeds and invasive species. Long-term impacts include a reduced recreation experience and reduced scenic qualities resulting from permanent above-ground facilities that could potentially be located near the trail crossing. Impacts on the CDNST are discussed further in Section 4.3.7

4.3.13.5.2.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Neither Alternative 3A: Proposed Action nor any other alternative routes or variations in Segment 3 cross recreation trails. Impacts on NHTs are discussed under Section 4.3.7.

4.3.13.5.2.5 230-Kilovolt Transmission Line

No trails are in the vicinity of the 230kV line transmission components; thus, no associated impacts would occur.

4.3.13.5.2.6 Mainline Valve Distribution Lines

Both alternative routes in Segment 2 cross the CDNST once for 0.1 mile. Short-term impacts as a result of the distribution lines might reduce access to the trail during construction. Long-term impacts would include reduced recreation setting, but these impacts could be minimized through burial of the distribution line or by using solar power at the MLV.

4.3.13.5.3 Off-Highway Vehicle and Other Motorized Trails

OHV areas crossed by the Project include "Limited to Existing Roads," "Designated," and "Limited" with seasonal designations. Impacts on OHV and other motorized trails would be low and are not discussed.

4.3.13.5.4 Scenic Byways and Backways

4.3.13.5.4.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.13.5.4.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Neither Alternative 1A: Proposed Action nor any other alternative routes or route variations in Segment 1 cross scenic byways and backways. Impacts on scenic byways and backways would be the same as those discussed for the No Action Alternative.

4.3.13.5.4.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Alternative 2A: Proposed Action crosses or parallels 39.7 miles of scenic byways or backways in Segment 2. Direct effects on the byways during construction include increased traffic from construction vehicles and temporary closure of the byways or backways. These effects are not anticipated to continue after construction and would be low. Vegetation types known to be susceptible to invasion by noxious weeds and invasive species, such as sagebrush communities, areas already disturbed, and riparian corridors, occur along the scenic byways or backways and could potentially affect the long-term recreation experience and affect visual resources. However, agency-required mitigation measures would be applied in these areas and residual impacts would be low. For additional discussion related to noxious weeds and invasive species, refer to Section 4.3.18.5. Impacts on visual resources of the byways and backways are discussed in Section 4.3.19.5.

Alternative 2B: Southern Route crosses or parallels 5.2 miles of scenic byways or backways in Segment 2. Impacts on scenic byways and backways would be the same as the impacts discussed for Alternative 2A: Proposed Action, but 34.5 fewer miles of scenic byways and backways would be crossed or paralleled.

4.3.13.5.4.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

No scenic byways or backways would be crossed in Segment 3 by Alternatives 3A: Proposed Action or 3B: Lost Creek to Lost Cabin. Impacts on scenic byways and backways for these alternative routes would be the same as the impacts from the No Action Alternative.

Alternative 3C: Lost Creek to Highway 20/26 crosses 0.1 mile of the South Bighorn/RedWall Back Country Byway where the western portion of the backway intersects U.S. Highway 20. Direct effects on the byway during construction include increased traffic on and temporary closure of the backway. These effects are not anticipated to continue after construction and restoration are complete. Impacts on visual resources of the byways are discussed in 4.3.19.5.

4.3.13.5.4.5 230-Kilovolt Transmission Line

No scenic byways or backways are in the vicinity of the 230kV line transmission components; thus, no identifiable impacts would be anticipated.

4.3.13.5.4.6 Mainline Valve Distribution Lines

The permanent above-ground facilities associated with the MLV distribution lines paralleling or crossing a scenic backway or byway would have long-term impacts on the recreational setting of that scenic backway or byway. However, these impacts on the recreational setting could be minimized through burial of the distribution line or by using solar power at the MLV. For additional information related to anticipated visual impacts of these distribution lines, refer to Section 4.3.19.5.

4.3.13.5.5 Recreation Opportunity Spectrum

4.3.13.5.5.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment will remain as it presently exists.

4.3.13.5.5.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Alternatives 1A: Proposed Action, 1A Variation: Dry Basin Draw, and 1B: Dry Piney would each cross ROS categories roaded natural for 0.5 mile and rural for 7.2 miles. Alternative 1C: Figure Four crosses 1.3 miles of roaded natural and 8.2 miles of rural, increasing impacts on roaded natural by 0.8 mile and rural by 1.0 mile.

Rural is managed for the setting and experience of a substantially modified natural environment and convenience of sites and opportunities with the prevalence of other individuals and groups. Residual impacts on rural would be short term, direct, and related to construction activities. Operations associated with a pipeline would not be disruptive of types of recreation activities occurring in the rural category.

Roaded natural is managed for the setting and experience of predominantly natural-appearing environment with low to moderate user interaction and resource modification evident. Residual impacts on roaded natural would be moderate. Long-term effects include diminished opportunity to interact with

the natural environment and increased interaction with other users because of permanent, above-ground facilities and improved access to the area.

4.3.13.5.5.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Alternative 2A: Proposed Action crosses 14.6 miles of roaded natural, 36.9 miles of rural, and 44.6 miles of semiprimitive motorized. Alternative 2B: Southern Route crosses 6.2 miles of roaded natural, 74.9 miles of rural, 22.2 miles of semiprimitive motorized, and 0.5 mile of semiprimitive non-motorized. Thus, Alternative 2B: Southern Route crosses 8.2 miles less of roaded natural, an additional 38.0 miles of rural, 22.4 miles less of semiprimitive motorized, and an additional 0.5 mile of semiprimitive non-motorized.

Residual impacts on roaded natural and rural would be the same as those discussed for Segment 1. Semiprimitive motorized is managed for a high degree of interaction with the natural environment and isolation from the sights and sounds of other humans. Residual impacts on semiprimitive motorized would be moderate. Long-term effects include diminished opportunity to interact with the natural environment and increased interaction with other users because of permanent, above-ground facilities and improved access to the area. Semiprimitive non-motorized is managed for high probability for experiencing isolation from the sights and sounds of other humans, and no motorized vehicles are permitted. Residual impacts on this class would be high as construction and operations would improve access and introduce new human sights and sounds, while permanent above-ground facilities would modify the natural environment. This would reduce the opportunity to experience isolation for users of the area.

4.3.13.5.5.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

No ROS classes would be crossed in Segment 3 by Alternatives 3A: Proposed Action, 3B: Lost Creek to Lost Cabin, or 3C: Lost Creek to Highway 20/26. Impacts on ROS classes would be the same for this segment as the impacts for the No Action Alternative.

4.3.13.5.5.5 230-Kilovolt Transmission Line

The 230kV transmission line would be in ROS class rural. This class is a substantially modified environment and the presence of this transmission line would not limit the types of recreational activities that occur in this class. There would be an opportunity for the spread of noxious weeds and invasive species, in addition to increased long-term access to the area with the construction of new access roads. However, in the short-term, access could be reduced temporarily during construction.

4.3.13.5.5.6 Mainline Valve Distribution Lines

ROS classes crossed by the Proposed Action and alternative pipeline routes include roaded natural, rural, semiprimitive motorized, and semiprimitive non-motorized. Construction and operation of the MLV distribution lines would temporarily increase access to these areas until road reclamation is complete. The recreation setting would be negatively affected by the presence of above-ground facilities; however, these impacts could be minimized through burial of the distribution line or by using solar power at the MLV.

4.3.13.6 Summary Comparison of Alternative Routes

All alternative routes in Segment 1 cross the same recreation management areas except for Alternative 1C: Figure Four, which does not cross any recreation management areas. Also, all alternative routes except for Alternative 1C: Figure Four could temporarily reduce access to the fishing access recreation sites near the Green River. Alternative 1C: Figure Four crosses the most ROS classes (9.5 miles) while all other alternative routes cross 7.7 miles. Considering that Alternative 1C: Figure Four is largely an

industrialized landscape where the recreation setting is already degraded, and considering the aforementioned discussion of recreation management areas, selection of Alternative 1C: Figure 4 would have the least impacts on recreation. In Segment 2, both alternative routes cross the same miles of SRMAs and ERMAs. Both alternative routes cross the same trail in the same location for the same distance. Both alternative routes also affect scenic backways or byways, though Alternative 2A: Proposed Action parallels or crosses more miles than Alternative 2B: Southern Route (39.7 miles versus 5.2 miles). Alternative 2A: Proposed Action crosses 96. 1 miles of ROS classes (44.6 of which are semiprimitive motorized), while Alternative 2B: Southern Route crosses 103.8 miles of ROS classes (22.2 of which are semiprimitive motorized and 0.5 mile of which are semiprimitive non-motorized). Because of the additional impacts on ROS and scenic byways and backways, Alternative 2B: Southern Route would have the least impacts on recreation.

In Segment 3, all alternative routes cross the same mileage of SRMAs and the Green Mountain ERMA. The only variance is the miles crossed of the Lander ERMA. For this, Alternative 3A: Proposed Action crosses the least amount of miles of the Lander ERMA (25.1 miles), while Alternative 3B: Lost Creek to Lost Cabin crosses the most miles of this ERMA (45.9 miles). Because of this, and because no other studied recreation resources are affected, Alternative 3A: Proposed Action would have the least impacts on recreation.

4.3.14 Social and Economic Conditions

4.3.14.1 Issues Identified for Analysis

Social and economic issues were identified based on the public Scoping Report (BLM 2014c) for this EIS, BLM guidance documents regarding social and economic analysis, statutory requirements regarding environmental justice, and prior experience of the study team with similar projects. Social and economic issues for the effects evaluation included the following topics:

- Effects on the economy, employment, and earnings. Specific issues raised in public scoping included:
  - Assessing the economic impacts on other businesses and the overall economy of Wyoming, including companies conducting EOR within established oil fields; and
  - Evaluating whether the Project would facilitate increased oil and gas production or exploration and evaluating any associated economic impacts
- Effects on population, housing, and public services
- Effects on government revenues
- Effects on property values, specifically:
  - Assessing the potential for land devaluation due to the presence of a pipeline transporting H_2S
- Effects on non-market values and effects on environmental justice populations

4.3.14.2 Types of Potential Effects

Short-term effects include social and economic effects that would occur during construction. These effects would include:

- Direct and indirect effects on employment, earnings, and economic output due to construction-related expenditures within the study area
- Additional demand for short-term housing and public services, such as police, emergency response, and health services
- Additional revenue for local governments—primarily from sales and lodging taxes

- Potential short-term effects on non-market economic values associated with any reduction in recreation activity due to temporary closures
- Effects on environmental justice populations

Long-term effects include effects that would continue to occur during operation of the Project. These effects would include:

- Direct and indirect employment, earnings, and economic output due to ongoing operations and maintenance, employment, and expenditures in the study area
- Employment and economic output resulting from the delivery and use of CO_2 from the Project to stimulate production in older well fields (These effects would occur outside the study area but are described in this section.)
- Small increases in demand for long-term housing and other public services arising from the permanent workforce and any indirect employment supported by operations and maintenance of the Project
- Additional revenues for local governments—primarily from property taxes on the Project facilities
- Potential effects on property values in proximity to the pipeline, particularly the segment of the pipeline conveying H_2S
- Effects on environmental justice populations

Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.14.3 Assessment of Impacts

Each of the alternative routes would involve the construction and operation of a new H_2S and CO_2 pipeline and the Riley Ridge Sweetening Plant. Construction would lead to an array of short-term economic effects, while operations would lead to longer-term economic effects. The short-term and long-term economic effects from the Project would be similar under any of the alternative routes. Economic effects from the Project, and most fiscal effects, were estimated using IMPLAN regional economic models. IMPLAN is an input/output modeling system originally developed for the USFS and is widely used by both private-sector and public-sector economists for impact analyses throughout the U.S. The IMPLAN models incorporated 2013 data for the study area and the IMPLAN study area data and production functions were not further customized for this analysis. Construction of the Project would produce three types of revenue streams that would stimulate the local economy—procurement of locally sourced goods and materials, wages paid to local construction workers, and the local expenditures of non-local construction workers during the period in which they are working and residing in the analysis area. The analysis of potential economic effects from construction was based on the "analysis by parts" technique, and each of these revenue streams was incorporated into the IMPLAN analysis. All results are shown in 2013 dollars.

Depending on how construction would be organized, the economic effects could be more concentrated in the larger communities, such as Rock Springs and Casper, but for IMPLAN modeling purposes, socioeconomic effects from pipeline construction and operations were distributed among the three segments in the study area based on the number of pipeline miles in each segment. The proportion of total pipeline mileage in each of the study area counties is a proxy for where the workforce will be working during the construction effort, so this method assumes that worker expenditures will occur in communities closest to the work sites. This is the best available approach to allocating the projected economic effects from construction, given that the temporary residence patterns of the workforce within the study area are not known. Projected total spending on labor and materials for Project construction was

divided between the pipeline and Riley Ridge Sweetening Plant based on the labor requirements for each component of the Project reported by the Applicant (SWCA 2014c).

To estimate short-term, construction-related effects on population and the demand for housing and public services, the study team relied on assumptions described in technical memoranda prepared by the Applicant. Key assumptions were that 75 percent of the construction workforce would be "imported" from outside the study area and that these non-local workers would bring an average of 0.3 dependents per worker with them during their work on the Project (SWCA 2014c). Due to the relatively short duration of the anticipated construction period and the fairly modest number of projected indirect workers employed due to "multiplier" effects compared to the size of the existing labor forces in the Rock Springs and Casper areas, these indirect jobs were assumed to be filled by existing study area residents without requiring additional migration into the study area. Long-term employment effects due to operations were assumed to result in permanent increases in study area population and demand for housing and public services.

Non-local workers would reside in the study area for the duration of the Project and would inevitably spend a portion of their income in the local economy. These local expenditures would likely primarily include housing, food, and entertainment. Based on previous studies, 50 percent of the non-local labor force's wages were assumed to be spent in the study area (Marcellus Shale Education & Training Center 2011).

The non-local workers would require short-term housing, and the analysis of effects on population, housing, and public services focuses on accommodation of this temporary construction work force. For purposes of considering potential effects on housing conditions, the number of projected non-local workers is compared to the estimated availability of rental housing, motel/hotel rooms, and RV sites within the study area. While temporary work camps could be created if necessary, local governments generally prefer that as much of the workforce as possible integrates into existing housing and infrastructure before additional services are created.

In response to comments during public scoping, the study team also developed generalized estimates of the economic effects that would result from the delivery and use of CO_2 from the Project to stimulate production in older well fields, though these economic effects would occur outside the study area (in eastern Montana). Since specific CO_2 delivery volumes are unknown at this time, the study team estimated the maximum potential economic effects resulting from enhanced oil production based on the pipeline capacity for the Project, a ratio of one barrel of additional oil production per 7.5 thousand cubic feet of CO_2 used in EOR based on prior industry studies (National Enhanced Oil Recovery Initiative 2012 and DOE 2015) and a recent study of the employment effects of CO_2 use in EOR in Wyoming (Cook 2013).

Potential effects on property values from proximity to the Project were evaluated based on previous studies in other locations. Most of these studies have focused on natural gas pipelines, which involve a greater level of potential risk than the CO_2 pipeline that would be developed as part of the Project. One study, in Alberta, specifically evaluated H_2S facilities (Boxall 2004). Land ownership is shown according to the alternative, with the exception of Alternative 1A Variation: Dry Basin Draw, which was not sufficiently different from Alternative 1A: Proposed Action to warrant separate analysis.

To estimate the effects of the Project on local government property tax revenues, the "market value" of the completed Project was assumed to be equivalent to the full cost of construction, and the value of the pipeline was assumed to be distributed across the study area (by county) based on the proportion of the line that would be in each county. Projected property tax revenues reflect the average tax rate in each county for all relevant taxing jurisdictions, including school districts. Property tax revenues would change

over time following completion of the proposed pipeline, as the facilities depreciate. This analysis assumes a 50-year project life and straight-line depreciation.

Evaluation of environmental justice effects involves assessment of the potential for disproportionately high effects on minority or low-income populations. Minority and low-income populations in proximity to the right-of-way for the Project were identified in Chapter 3, on the basis of census data at the census tract level. Census tracts typically include 2,500 to 8,000 people and, in rural areas, can be quite large in geographic area. For purposes of this assessment, the population in closest proximity to the right-of-way for the Proposed Action and alternative routes was assumed to have the same characteristics (e.g., minority or low-income status) as the overall population census tract in which they are located.

4.3.14.4 Mitigation Planning

Design features of the Proposed Action and agency-required mitigation measures would not be applied to address potential impacts on social and economic conditions.

4.3.14.5 Results (Direct and Indirect Residual Effects)

4.3.14.5.1 Economy, Employment, and Earnings

4.3.14.5.1.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the economy, employment, and earnings environment will remain as it presently exists.

4.3.14.5.1.2 Overall Economic Effects from the Proposed Action and Alternative Routes

Short-Term Construction Effects across the Socioeconomic Study Area

During a projected construction period of approximately 2 years for both the pipeline and the Riley Ridge Sweetening Plant, the Applicant would hire a number of local workers and bring in a larger number of non-local workers to complete the Project. The workers would spend money on materials and services for construction, with the majority of those expenditures going to suppliers within the analysis area.

Based on information provided by the Applicant, an annualized average of 234 workers would be needed to complete the pipeline and 67 workers to complete the Riley Ridge Sweetening Plant over the 2-year construction period (SWCA 2014c). Of the 301 total workers, 75 are expected to be hired from the local workforce.

The Riley Ridge Sweetening Plant would be constructed over a 2-year period, which would support approximately 109 annual jobs, $8.6 million in labor earnings, and $24.2 million in total economic output, as shown in Table 4-80. This includes 67 annual direct jobs, $6.8 million in direct labor earnings, and $18.6 million in direct output. The indirect effects capture the economic activities supported by local purchases of supplies and materials for construction, household expenditures by the locally hired workers, and local expenditures by non-local workers during the construction period.

Table 4-80
Projected Short-Term Annual Effects of Riley Ridge Sweetening Plant Construction

	Direct	Indirect	Total
Jobs	67	42	109
Labor Earnings	$6.8	$1.8	$8.6
Output	$18.6	$5.6	$24.2

SOURCE: IMPLAN Group, LLC (IMPLAN) 2015; NOTE: $ in Millions

Across the four-county study area, construction of the proposed pipeline is projected to support an annualized total of approximately 380 short-term jobs during the construction phase, as shown in Table 4-81. This total includes the projected 234 annualized direct jobs associated with construction, as well as 146 indirect jobs that would be supported by local purchases of supplies and materials for construction, household expenditures by the locally hired workers, and local expenditures by non-local workers during the construction period.

Table 4-81
Projected Short-Term Annual Effects of Pipeline Construction

	Direct	Indirect	Total
Jobs	234	146	380
Labor Earnings	$23.9	$6.1	$30
Output	$64.8	$20.0	$85.8

SOURCE: IMPLAN 2015
NOTE: $ in Millions

In addition to the $23.9 million in annual compensation anticipated to be paid to construction workforce, construction of the pipeline is projected to indirectly produce an additional $6.1 million in annual labor earnings during the 2-year construction period.

Overall, construction of the pipeline is projected to produce a short-term, annual increase in regional output of $85.8 million during the 2-year construction period. This total includes the projected $64.8 million increase in direct output due to the purchase of locally sourced construction goods and materials, along with $20.0 million in additional regional output due to recirculation of the wages paid to construction workers. This information is summarized in Table 4-81.

Long-Term Operation and Maintenance Effects across the Socioeconomic Study Area and Beyond the Study Area

Economic effects of operations and maintenance of the Project would continue throughout the course of the projected 50-year project life.

Every year, pipeline operations and maintenance would support approximately 8 direct jobs and 12 indirect jobs in other industries, as shown in Table 4-82. Pipeline operations and maintenance would support roughly $2.4 million in total labor earnings and $5.5 million in total regional economic output.

Table 4-82
Projected Long-Term Annual Effects of Pipeline Operations

	Direct	Indirect	Total
Jobs	8	12	20
Labor Earnings	$1.9	$0.5	$2.4
Output	$3.9	$1.6	$5.5

SOURCE: IMPLAN 2015
NOTE: $ in Millions

Operations and maintenance of the Riley Ridge Sweetening Plant would also stimulate economic activity, as shown on Table 4-83. Approximately 8 people would be employed at the plant and an additional 23 jobs would be indirectly supported in other industries. These jobs would support a total of $1.6 million in labor earnings and $19.3 million in total regional economic output within Sublette County.

Table 4-83 Projected Long-Term Annual Effects of Sweetening Plant Operations			
	Direct	**Indirect**	**Total**
Jobs	8	23	31
Labor Earnings	$0.4	$1.2	$1.6
Output	$15.1	$4.2	$19.3
SOURCE: IMPLAN 2015 NOTE: $ in Millions			

The largest potential economic effects associated with the Project would likely occur outside the study area. The purpose of the Project is to deliver CO_2 to older oil and gas fields in eastern Montana to stimulate additional production from those fields.

At the proposed pipeline's maximum capacity, delivery of up to 600 MMcf/d of CO_2 could stimulate an increase in oil production of up to 80,000 barrels per day. This volume is approximately equivalent to Montana's current statewide oil production level (DOE 2015b).

At the current depressed price of oil, approximately $50 per barrel, the annual value of the maximum oil production that could be stimulated by the proposed pipeline would be approximately $1.5 billion per year. The DOE's reference case forecasts anticipate that the price of oil will reach approximately $91 per barrel by 2025 (DOE 2015c). Under this future price scenario, the annual value of the maximum oil production that could be stimulated by the proposed pipeline would be approximately $2.7 billion per year.

A recent study of the effects on employment from additional oil production using CO_2-EOR in Wyoming estimated that each million barrels of oil produced annually through CO_2-EOR supported a total of 188 jobs throughout the state of Wyoming, including secondary or "multiplier" effects (Cook 2013). Assuming the relationship between additional oil production through CO_2-EOR and employment is similar in Montana, since no comparable study has been published in that state, the Wyoming analysis can be used to project the maximum potential employment effects from operation of the proposed RRNP. At the maximum delivery rate of 600 MMcf/d, the proposed pipeline could stimulate the production of up to 29 million barrels of oil per year. Assuming each million barrels supports 188 total jobs, this level of additional oil production could support approximately 5,490 jobs. Most of these potential jobs would likely be based in Montana, though some employment might spill over to oil service firms or other suppliers based in Wyoming or other states.

4.3.14.5.1.3 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction

Construction of the Riley Ridge Sweetening Plant would require an estimated peak construction force of 174 workers (refer to Appendix A Resource Report 5 of the preliminary POD [note: the preliminary POD is included as Appendix A of this EIS]). Local and non-local labor forces have been estimated based on skilled and unskilled labor availability, primarily from the areas that surround Rock Springs, Rawlins, Lander, Riverton, and Casper. Smaller but local communities such as Pinedale and Big Piney also may contribute to the proposed project work force. Work force availability in these cities may contribute to the percentage of local workers. A local worker is identified as a worker who is able to commute to and from his permanent place of residence on a daily basis. A non-local worker is identified as a worker who has moved into the construction area for the duration of the proposed project. Sweetwater, Carbon, Fremont, and Natrona counties have a fairly large construction employment sector from which the labor force would be drawn. The labor force is assumed to be composed of 25 percent (44 peak workers at the Riley

Ridge Sweetening Plant) local labor during construction. Local employment opportunities initiated by the proposed Project construction would be considered beneficial to the local area economies.

Because of the relatively short duration of construction, it is assumed that only a small percentage of the non-local work force would bring their families. Adverse social, economic, and community infrastructure impacts of construction personnel are considered minimal because of the quick pace and short duration of the construction schedule. The number of workers would be small relative to the regional population.

Injection Wells

No socioeconomic impacts are anticipated specifically from the construction or operation of the proposed injection wells.

Segment 1 Pipeline Alternative Routes

Short-Term Construction Effects in Segment 1

Construction of both the pipeline and the Riley Ridge Sweetening Plant would occur in Segment 1. Segment 1 is the shortest pipeline segment from Riley Ridge to the Riley Ridge Sweetening Plant and is entirely within Sublette County. Proposed pipeline construction has the potential to support a total of 53 jobs in Sublette County, $4.2 million in labor earnings, and $11.9 million in total output.

In Segment 1, plant construction has the potential to support 109 jobs, $8.6 million in labor earnings, and $24.2 million. Roughly 67 jobs, $6.8 million in labor earnings, and $18.6 million in total output would be directly related to Riley Ridge Sweetening Plant construction. The remainder would be indirectly supported by recirculation of construction workers' wages and purchases of goods and services. Total effects of construction of the plant and pipeline in Segment 1 are shown in Table 4-84.

Table 4-84
Projected Short-Term Annual Effects of Construction in Segment 1

	Direct	Indirect	Total
Jobs	100	62	162
Labor Earnings	$10.1	$2.7	$12.8
Output	$27.7	$8.4	$36.1

SOURCE: IMPLAN 2015
NOTE: $ in Millions

Long-Term Operating and Maintenance Effects in Segment 1

Operation and maintenance of both the Riley Ridge Sweetening Plant and the pipeline would have long-term economic effects in Segment 1. Operation of the pipeline would annually support three jobs, approximately $400,000 in labor earnings, and $500,000 in economic output. Operation and maintenance of the Riley Ridge Sweetening Plant would annually support 31 jobs, $1.6 million in labor earnings, and $19.3 million in total economic output.

These combined economic effects in Segment 1 are shown in Table 4-85.

Table 4-85
Projected Long-Term Annual Effects of Operations in Segment 1

	Direct	Indirect	Total
Jobs	9	25	34
Labor Earnings	$0.7	$1.28	$2.0
Output	$15.5	$4.3	$19.8

SOURCE: IMPLAN 2015
NOTE: $ in Millions

4.3.14.5.1.4 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Short-Term Construction Effects in Segment 2

Segment 2 is the longest segment and crosses both Sweetwater and Fremont Counties. The degree to which the pipeline crosses Sweetwater County varies by alternative route. During construction, approximately 201 jobs, $15.9 million in labor earnings, and $44.9 million in economic output would occur within these two counties, as shown in Table 4-86.

Table 4-86
Projected Short-Term Annual Effects of Pipeline Construction in Segment 2

	Direct	Indirect	Total
Jobs	124	77	201
Labor earnings	$12.7	$3.2	$15.9
Output	$34.3	$10.6	$44.9

SOURCE: IMPLAN 2015
NOTE: $ in Millions

Long-Term Operating and Maintenance Effects in Segment 2

Operation and maintenance of the pipeline in Segment 2 would support eight jobs, $1.3 million in labor earnings, and $2.0 million in economic output. Long-term economic effects in Segment 2 are shown in Table 4-87.

Table 4-87
Projected Long-Term Annual Effects of Pipeline Operations in Segment 2

	Direct	Indirect	Total
Jobs	4	6	8
Labor earnings	$1.0	$0.3	$1.3
Output	$1.5	$0.5	$2.0

SOURCE: IMPLAN 2015
NOTE: $ in Millions

4.3.14.5.1.5 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Short-Term Construction Effects in Segment 3

Segment 3 crosses Fremont and Natrona counties under almost all alternative routes. The exception is Alternative 3C: Lost Creek to Lost Cabin, which only crosses Fremont County. During construction, approximately 125 jobs, $9.9 million in labor earnings, and $28.3 in economic output would occur within these two counties, as shown in Table 4-88.

Table 4-88
Projected Short-Term Annual Effects of Pipeline Construction in Segment 3

	Direct	Indirect	Total
Jobs	77	48	125
Labor earnings	$7.9	$2.0	$9.9
Output	$21.4	$6.6	$28.3

SOURCE: IMPLAN 2015
NOTE: $ in Millions

Long-Term Operating and Maintenance Effects in Segment 3

Operation and maintenance of the pipeline in Segment 3 would support seven jobs, $800,000 in labor earnings, and $1.3 million in economic output. Long-term economic effects in Segment 3 are shown in Table 4-89.

Table 4-89
Projected Long-Term Annual Effects of Pipeline Operation in Segment 3

	Direct	Indirect	Total
Jobs	3	4	7
Labor earnings	$0.6	$0.2	$0.8
Output	$1.0	$0.3	$1.3

SOURCE: IMPLAN 2015
NOTE: $ in Millions

4.3.14.5.1.6 230-Kilovolt Transmission Line

As part of the proposed action, PacifiCorp would construct a 0.9-mile segment of new transmission line to provide power to the Sweetening Plant. Construction of the transmission line would take place over an estimated six-month period during the construction of the plant, and would provide an additional minor short-term stimulus to local employment, labor earnings and economic output in Segment 1. Mainline Valve Distribution Lines

The mainline valve distribution lines would be constructed as part of the overall construction of the pipeline. Regional economic effects from construction of the mainline valve distribution lines are included in the overall economic effects estimates from pipeline construction discussed previously.

4.3.14.5.2 Population, Housing, and Public Services

4.3.14.5.2.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the population, housing inventory, and availability of public services will remain as it presently exists.

4.3.14.5.2.2 Overall Effects from the Proposed Action and Alternative Routes

Short-Term Construction Effects

During the 2-year construction period, approximately 225 non-local workers would reside within the study area. The non-local workers would bring roughly 68 accompanying dependents (SWCA 2014c).

The construction workforce and their families would not be evenly distributed across the study area throughout the construction period. Instead, much of that workforce would be expected to move across the study area as construction proceeds. In the sparsely populated portions of the study area, the relative magnitude of the population increase could be more substantial. These localized effects, however, would occur for only a portion of the 2-year construction period.

During the construction period, there would likely be a short-term increase in demand for public services. This increased demand would come from the influx of workers, as well as the nature of the workforce. Transient labor workforces often place additional demands on police, emergency, and health services. Given the short-term Project time frame and the relatively small number of projected non-local workers, the effects on public services are likely to be manageable for the existing public service providers identified in Chapter 3.

Long-Term Operating and Maintenance Effects

As noted previously, ongoing operations and maintenance would require relatively few direct workers (16), so the Project would have minimal long-term effects on the population of the study area.

Given the modest long-term effects on population, the annual operation of the Project is not estimated to have notable impacts on the demand for housing or public services.

4.3.14.5.2.3 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Short-Term Construction Effects in Segment 1

Construction of the proposed Riley Ridge Sweetening Plant and the portion of the pipeline in Segment 1 would lead to an increase of approximately 98 residents (workers and dependents) in the local population for the 2-year construction period. This temporary population would require approximately 75 housing units during that time.

As detailed in Table 3-97 (Section 3.2.14.6), there are an estimated 590 housing units available for rent in Segment 1. In addition to shorter-term hotel/motel and RV site lodging options, there should be sufficient housing available for all non-local workers. Because pipeline construction activity would be concentrated during the period from August 1st to December 15th each year, construction workers could compete for short-term lodging in hotels and motels with hunters and other seasonal visitors. Such competition may push up short-term rental rates and could lead to temporary shortages of short-term accomodations.

Long-Term Operation and Maintenance Effects in Segment 1

All of the Riley Ridge Sweetening Plant operational workers would likely reside within Segment 1. Based on the projected permanent operating requirements of eight direct jobs at the Riley Ridge Sweetening Plant, the Project would have minimal effects on local population, housing, and public services in Segment 1. Pipeline operations and maintenance may require approximately one worker to be located within this segment.

4.3.14.5.2.4 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Short-Term Construction Effects in Segment 2

During construction of the proposed pipeline in Segment 2, approximately 121 additional people would reside in the area, including approximately 93 non-local workers and approximately 28 dependents. This temporary workforce would require approximately 93 housing units.

As detailed in Table 3-97 (Section 3.2.14.6), there are approximately 1,900 housing units available for rent in Segment 2 (Sublette and Sweetwater counties). In addition to shorter-term hotel/motel and RV site lodging options, there should be sufficient housing available for all non-local workers. However, because pipeline construction activity would be concentrated during the period from August 1st to December 15th each year, construction workers could compete for short-term lodging in hotels and motels with hunters and other seasonal visitors. Such competition may push up short-term rental rates and could lead to temporary shortages of short-term accomodations.

Long-Term Operation and Maintenance Effects in Segment 2

Operation and maintenance of the portions of the pipeline that would be in Segment 2 would require approximately four employees. Long-term operations and maintenance of the Project would have minimal effects on local population, housing, and public services in Segment 2.

4.3.14.5.2.5 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Short-Term Construction Effects in Segment 3

During construction of the proposed pipeline in Segment 3, approximately 75 additional people would reside in the area, including approximately 58 non-local workers and approximately 17 dependents. This temporary workforce would require approximately 58 housing units.

As detailed in Table 3-97 (Section 3.2.14.6), there are approximately 2,700 housing units available for rent in Segment 3 (Natrona and Fremont counties). In addition to shorter-term hotel/motel and RV site lodging options, there should be sufficient housing available for all non-local workers. Because pipeline construction activity would be concentrated during the period from August 1st to December 15th each year, construction workers could compete for short-term lodging in hotels and motels with hunters and other seasonal visitors. Such competition may push up short-term rental rates and could lead to temporary shortages of short-term accomodations.

Long-Term Operation and Maintenance Effects in Segment 3

Operation and maintenance of the portions of the pipeline that would be in Segment 3 would require approximately three employees. Long-term operations and maintenance of the Project would have minimal effects on local population, housing, and public services in Segment 3.

4.3.14.5.2.6 230-Kilovolt Transmission Line

Construction of the 0.9-mile segment of transmission line over an estimated six-month period during the construction of the plant could lead to minor, short-term increases in demand for population, housing, and public services in Segment 1.

4.3.14.5.2.7 Mainline Valve Distribution Lines

Effects on population, housing, and public services from construction of the MLV distribution lines are included in the effects estimates described in Section 4.3.14.5.2.2 through Section 4.3.14.5.2.5.

4.3.14.5.3 Local Taxes and Government Revenue

4.3.14.5.3.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the economic environment would remain as it presently exists.

4.3.14.5.3.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Short-Term Construction Effects in Segment 1

Local economic activity generated by construction of the pipeline would generate approximately $244,000 in state and local taxes in Segment 1. Construction of the Riley Ridge Sweetening Plant would generate approximately $245,000 in state and local government revenue. The largest source of short-term construction tax revenues would be from sales taxes, but the Project would also generate property taxes, severance taxes, and other tax and fee revenues.

Long-Term Operating and Maintenance Effects in Segment 1

Economic activity from long-term operations of the proposed Riley Ridge Sweetening Plant and the pipeline would generate approximately $220,000 in annual state and local taxes. This value does not take

into account the ongoing property taxes generated from the value of the Project itself. Estimated local property taxes from the proposed Riley Ridge Sweetening Plant and pipeline are shown in Table 4-90.

Table 4-90
Potential Property Taxes for Segment 1 ($Millions)

County	A		B		C	
	1st year	50 years	1st year	50 years	1st year	50 years
Sublette County	$1.28	$33.01	$1.36	$34.56	$1.42	$36.14
NOTE: Property tax revenue includes pipeline and Riley Ridge Sweetening Plant construction						

The estimates shown above assume the average county tax rate; however, this would vary widely across individual taxing districts.

4.3.14.5.3.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Short-Term Construction Effects in Segment 2

Local economic activity generated by construction of the pipeline would generate approximately $924,000 in state and local taxes in Segment 2. This includes sales tax, property tax, and other tax revenues in both Fremont and Sweetwater counties.

Long-Term Operating and Maintenance Effects in Segment 2

Economic activity from long-term pipeline operations in Segment 2 would generate approximately $129,000 in tax revenues for state and local governments. Table 4-91 shows potential additional local property tax revenues from the pipeline.

Table 4-91
Potential County Property Taxes for Segment 2 ($Millions)

County	A		B	
	1st year	50 years	1st year	50 years
Sublette County	$0.54	$13.73	$0.12	$2.94
Sweetwater County	$1.34	$34.30	$1.96	$50.06

The estimates shown above assume the average county tax rate; however, this would vary widely across individual taxing districts.

4.3.14.5.3.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Short-Term Construction Effects in Segment 3

Local economic activity generated by construction of the pipeline would generate approximately $575,000 in state and local taxes in Segment 3. This includes sales tax, property tax, and other tax revenues in both Fremont and Sweetwater counties.

Long-Term Operating and Maintenance Effects in Segment 3

According to the IMPLAN model, spending from pipeline operations in Segment 3 would generate approximately $80,000 in tax revenues for state and local governments. Table 4-92 shows potential additional property tax revenues from the pipeline.

Table 4-92 Potential County Property Taxes for Segment 3 ($Millions)						
County	**A**		**B**		**C**	
	1st year	**50 years**	**1st year**	**50 years**	**1st year**	**50 years**
Fremont County	$0.80	$20.48	$1.25	$31.98	$1.22	$31.14
Natrona County	$0.59	$14.97	$-	$-	$0.49	$12.42

The estimates shown above assume the average county tax rate; however, this would vary widely across individual taxing districts.

4.3.14.5.3.5 230-Kilovolt Transmission Line

There are no anticipated effects on local taxes and government revenue from the proposed 230kV transmission line.

4.3.14.5.3.6 Mainline Valve Distribution Lines

There are no anticipated effects on local taxes and government revenue from the MLV distribution lines

4.3.14.5.4 Property Values

4.3.14.5.4.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.14.5.4.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Each of the alternative routes would involve the construction and operation of a new, nongaseous H_2S /CO_2 pipeline from the Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant. The pipeline would cross approximately 30 miles in Sublette County.

Short-Term Construction Effects in Segment 1

Construction of the H_2S /CO_2 pipeline would temporarily affect properties and property values near the facilities. The H_2S /CO_2 pipeline route would require a permanent 50-foot-wide right-of-way and an additional 25-foot-wide temporary easement, all of which would be stripped of vegetation and topsoil and constructed for pipeline installation. In some areas, where terrain or other features require more room to work, an additional 25-foot-wide ATWS would also be developed. The ATWS also would be stripped of vegetation and topsoil, for a total width of disturbance of 75 to 100 feet. Landowners along the route could expect temporary disruption in the quiet enjoyment of their properties from construction and construction-related activity.

Under the Proposed Action and the two alternative pipeline alignments considered in this EIS, the H_2S /CO_2 pipeline would cross relatively sparsely developed lands. As shown in Table 4-93, under any of the alternative routes, most of the lands crossed by the pipeline in Segment 1 are federally owned and managed by BLM. Alternative 1B: Dry Piney crosses the most private land, approximately 7 miles of the 34-mile total length of the pipeline under that alternative.

Table 4-93 Ownership of Land Traversed by Pipeline for Segment 1 (miles)			
Ownership	**A**	**B**	**C**
Federal			
Bureau of Reclamation	0	0	0
Bureau of Land Management	25	24	32
U.S. Forest Service	0	0	0
State	3	3	3
Private	3	7	3

Long-Term Operating and Maintenance Effects in Segment 1

Hydrogen sulfide is a dangerous chemical that can be hazardous or fatal to humans and animals even at relatively low concentrations (Boxall 2004). Consequently, the proposed H_2S /CO_2 pipeline in Segment 1 may be considered a hazard that could affect nearby property values due to perceived risk.

The only published study known to have examined the effects of H_2S pipelines on property values was conducted by economists from the University of Alberta and Wilfrid Laurier University in 2004. Focusing on private property transactions in proximity to oil and gas facilities in Alberta, that study found that the presence of an H_2S pipeline within 4 kilometers (approximately 2.4 miles) reduced residential property values by approximately 2.2 percent (Boxall 2004). While it seems intuitive that the effects on property values might be somewhat larger for properties in the closest proximity to H_2S pipelines (such as those properties actually crossed by the pipelines) and somewhat smaller for properties approaching the 4-kilometer distance from the pipelines, potential differences in property value effects within the 4-kilometer range cannot be determined from the Alberta study.

Table 4-94 depicts the ownership of lands within a 6-mile "buffer" from the proposed routes for the H_2S /CO_2 pipeline in Segment 1. The 6-mile buffer (3 miles on either side of the pipeline) is consistent with the buffer used for the visual effects analysis in this EIS and allows for the possibility that there could be very small effects on property values beyond the 4-kilometer range analyzed in the Alberta study. As shown in Table 4-94, the distribution of land ownership within the 6-mile buffer from each of the alternative routes is quite similar. Each alternative includes approximately 40 to 45 square miles of privately owned land within the 6-mile buffer from the potential pipeline routes.

Table 4-94 Land Ownership for the 6-Mile Buffer for Segment 1 (square miles)			
Ownership	**A**	**B**	**C**
Federal			
Bureau of Reclamation	1	0	0
Bureau of Land Management	150	170	189
U.S. Forest Service	0	1	1
State	8	9	11
Private	40	44	45

4.3.14.5.4.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

In Segment 2, the proposed pipeline would convey only CO_2, which is not considered a hazardous chemical.

Short-Term Construction Effects in Segment 2

Construction of the CO_2 pipeline in Segment 2 would temporarily affect properties and property values near the facilities. Like the H_2S /CO_2 pipeline in Segment 1, the CO_2 pipeline route would include a 50-foot-wide permanent right-of-way, which would be stripped of vegetation and topsoil. The CO_2 pipeline route would also include an additional 50-foot-wide ATWS, for a nominal 100-foot-wide construction right-of-way. Other ATWSs may be needed at locations where terrain or other features require more room to work.

Under Alternatives 2A: Proposed Action and Alternative 2B: Southern Route, the CO_2 pipeline in Segment 2 would cross relatively sparsely developed lands. As shown in Table 4-95, under both alternative routes, most of the lands crossed by the pipeline in Segment 2 are federally owned and managed by the BLM. However, Alternative 2B: Southern Route crosses approximately 10 times as much private land—approximately 10 miles of the 137-mile total length of the pipeline in Segment 2 under that alternative.

Table 4-95
Ownership of Land Traversed by Pipeline for Segment 2 (miles)

Ownership	A	B
Federal		
Bureau of Reclamation	0	0
Bureau of Land Management	122	124
U.S. Forest Service	0	0
State	7	3
Private	1	10

Long-Term Operating and Maintenance Effects in Segment 2

No known studies, published or unpublished, have examined the effects of the presence of CO_2 pipelines on private property values. A number of studies, however, have examined potential effects of natural gas pipelines on property values. Despite the greater potential risk associated with natural gas pipelines (relative to a CO_2 pipeline), the only effects on property values found in the any of the nine studies gathered and reviewed for this EIS were under circumstances where a major spill and damage or injury had occurred from a nearby natural gas pipeline. Given the relatively low risk associated with the proposed CO_2 pipeline, it appears unlikely that there would be any long-term effect on property values from proximity to the pipeline in Segment 2.

4.3.14.5.4.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

As in Segment 2, the proposed pipeline would convey only CO_2 in Segment 3.

Short-Term Construction Effects in Segment 3

As in the other segments, construction of the CO_2 pipeline in Segment 3 would likely have a temporary effect on properties crossed by the facilities and on property values. Table 4-96 depicts land ownership along the alternative routes in Segment 3. Alternative 3B: Lost Creek to Lost Cabin would be the least disruptive to private landowners because it crosses only 18 miles of private land, compared to 36 miles of privately owned lands under Alternative 3A: Proposed Action and 43 miles of privately owned land under Alternative 3C: Lost Creek to Highway 20/26.

Table 4-96 Ownership of Land Traversed by Pipeline for Segment 3 (miles)			
Ownership	**A**	**B**	**C**
Federal			
Bureau of Reclamation	0	0	0
Bureau of Land Management	40	51	50
U.S. Forest Service	0	0	0
State	7	4	4
Private	36	18	43

Long-Term Operating and Maintenance Effects in Segment 3

As in Segment 2, it appears unlikely that there would be any long-term effect on property values from proximity to the pipeline in Segment 3.

4.3.14.5.4.5 230-Kilovolt Transmission Line

There are no anticipated effects on property values from the proposed 230kV transmission line.

4.3.14.5.4.6 Mainline Valve Distribution Lines

There are no anticipated effects on property values from the MLV distribution lines.

4.3.14.5.5 Non-Market Values

Non-market values can include passive, or non-use, values, such as the amenity values received by residents and landowners in proximity to public lands and the value of ecosystem service, such as carbon sequestration or species preservation provided by public lands.

4.3.14.5.5.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the non-market environment would remain as it presently exists.

4.3.14.5.5.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Under Alternative 1A: Proposed Action and any of the other alternative routes, there could be short-term effects on recreation activity in Segment 1 due to pipeline construction, as described in Section 4.3.13.5. Such effects would have corresponding short-term effects on non-market values associated with recreation in the study area. Longer-term pipeline operations would likely have little or no effect on non-market values in Segment 1.

4.3.14.5.5.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Under Alternative 2A: Proposed Action and any of the other alternative routes, there could be short-term effects on recreation activity in Segment 2 due to pipeline construction, as described in Section 4.3.13.5. Such effects would have corresponding short-term effects on non-market values associated with recreation in the study area. Longer-term pipeline operations would likely have little or no effect on non-market values in Segment 2.

4.3.14.5.5.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Under Alternative 3A: Proposed Action and any of the other alternative routes, there could be short-term effects on recreation activity in Segment 3 due to pipeline construction, as described in 4.3.13.5. Such effects would have corresponding short-term effects on non-market values associated with recreation in the study area. Longer-term pipeline operations would likely have little or no effect on non-market values in Segment 3.

4.3.14.5.5.5 230-Kilovolt Transmission Line

There are no anticipated effects on non-market values from the proposed 230kV transmission line.

4.3.14.5.5.6 Mainline Valve Distribution Lines

There are no anticipated effects on non-market values from the MLV distribution lines.

4.3.14.5.6 Environmental Justice

4.3.14.5.6.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.14.5.6.2 Overall Effects from the Proposed Action and Alternative Routes

The Proposed Action and all other alternative routes cross six Wyoming census tracts. Due to their proximity to the Proposed Action, and other alternative routes, residents in these six census tracts could be disproportionately affected. However, none of the six census tracts contain populations contain populations that are environmental justice communities as defined in Chapter 3. Figure 4-2 and Figure 4-3 show the percentage of individuals below the poverty level and the percentage minority by census tract. Poverty, race, and ethnicity details by census tract are shown in Table 4-97.

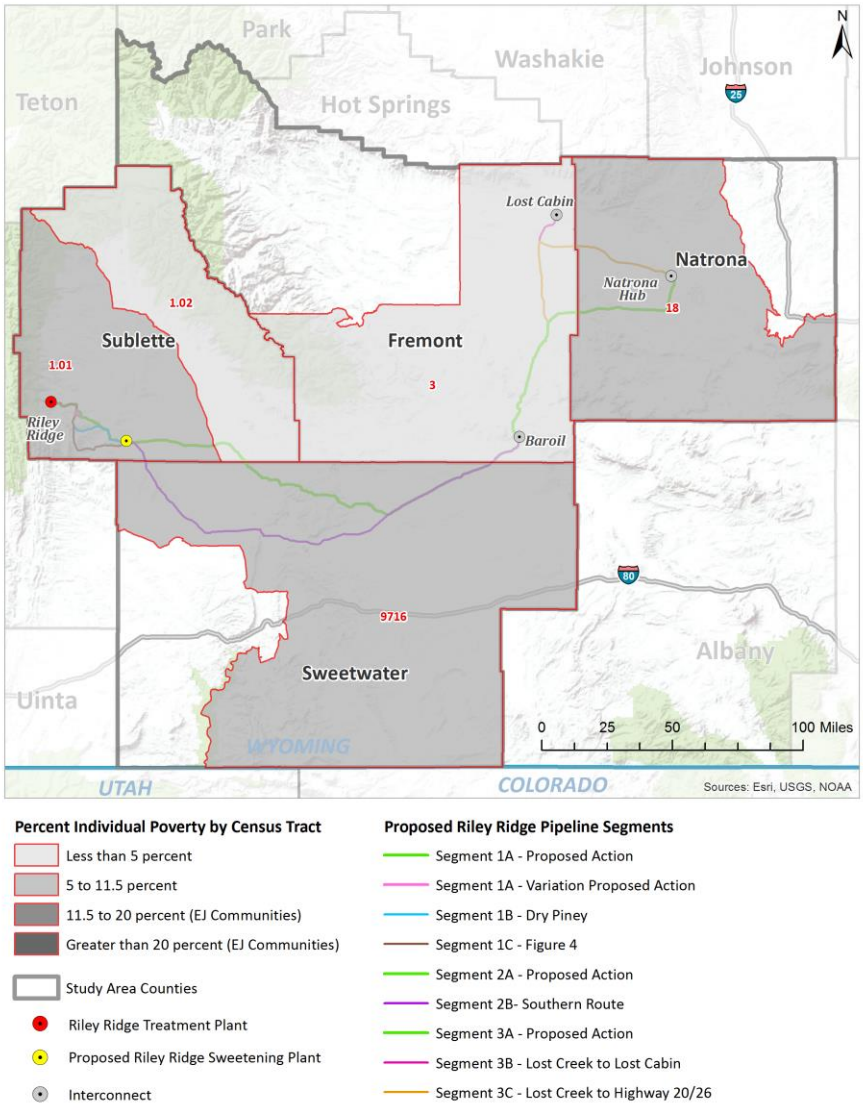


Figure 4-2 Percentage of Individuals below Poverty Level by Census Tract Traversed by Pipeline

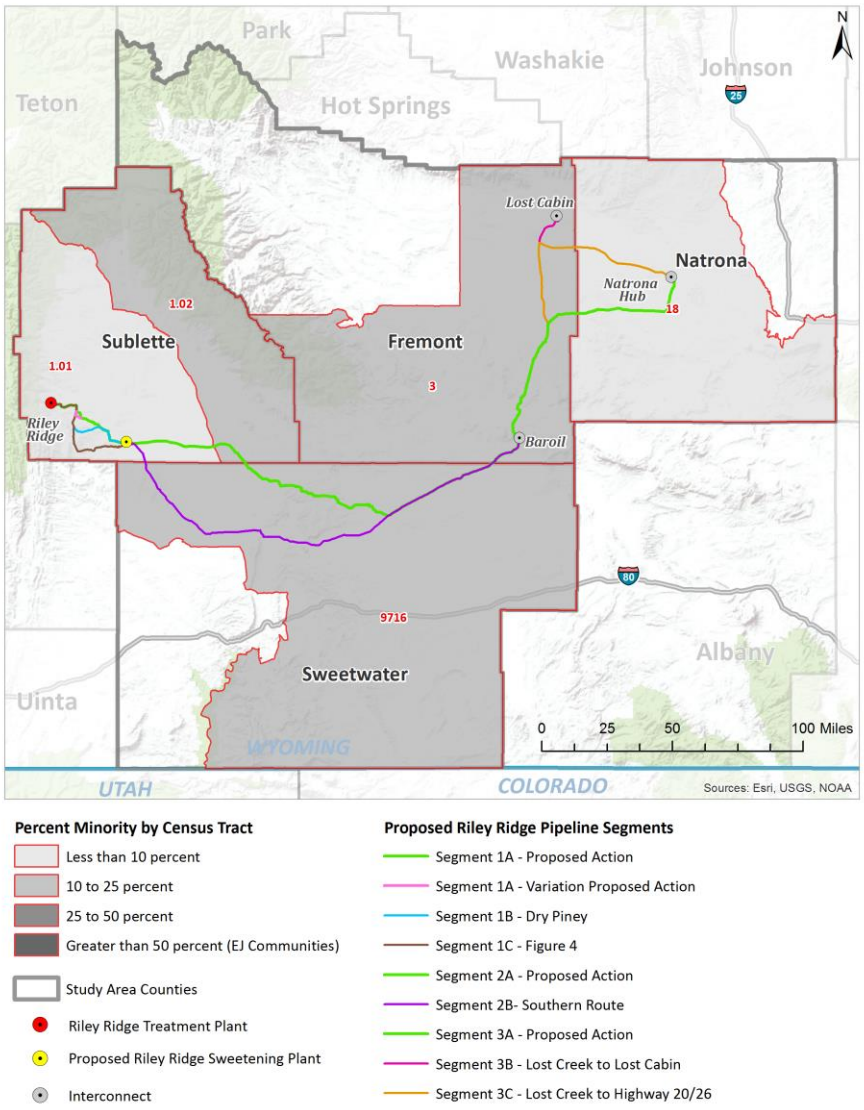


Figure 4-3 Percentage of Minorities by Census Tract Traversed by Pipeline

Table 4-97
2013 Minority and Low-Income Percentages

Area	Total Population	White (Non-Hispanic)	Hispanic Latino	African American	Native American	Asian	Native Hawaiian or Pacific Islander	Total Minority	Individuals Below Poverty Level	Families Below Poverty Level
Wyoming	570,134	85.2	9.2	0.9	2.3	0.8	0.0	14.8	11.5	7.7
Fremont										
Census Tract 3	4,181	89.3	6.1	0.3	1.6	1.0	0.6	10.7	3.9	3.0
Natrona										
Census Tract 18	4,425	94.6	2.6	0.3	1.3	0.0	0.0	5.4	7.2	5.5
Sublette County										
Census Tract 1.01	3,980	91.9	3.2	0.0	0.3	0.0	0.1	8	8.1	7.4
Census Tract 1.02	6,198	82.1	9.9	0.0	0.4	1.5	0.0	18	17.9	3.3
Sweetwater										
Census Tract 9716	2,081	87.8	9.4	0.3	0.0	0.3	0.0	12	12.2	2.3

SOURCE: U.S. Census Bureau 2013

4.3.14.5.6.3 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Short-Term Construction Effects in Segment 1

Construction of both the pipeline and Riley Ridge Sweetening Plant in Segment 1 would occur within one of two census tracts in Sublette County. Neither are environmental justice communities, as identified in Chapter 3.

Long-Term Operating and Maintenance Effects in Segment 1

Long-term effects in Segment 1 would occur in the same census tracts as the short-term effects and would not affect any environmental justice communities.

4.3.14.5.6.4 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Short-Term Construction Effects in Segment 2

Construction of the Segment 2 pipeline would not affect any environmental justice communities.

Long-Term Operating and Maintenance Effects in Segment 2

Long-term effects in Segment 2 would occur in the same census tracts as the short-term effects and would not affect any environmental justice communities.

4.3.14.5.6.5 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Short-Term Construction Effects in Segment 3

Construction of the Segment 3 pipeline would not affect any environmental justice communities.

Long-Term Operating and Maintenance Effects in Segment 3

Long-term effects in Segment 3 would occur in the same census tracts as the short-term effects and would not affect any environmental justice communities.

4.3.14.5.6.6 230-Kilovolt Transmission Line

There are no anticipated effects on environmental justice populations from the proposed 230kV transmission line.

4.3.14.5.6.7 Mainline Valve Distribution Lines

There are no anticipated effects on environmental justice from the MLV distribution lines.

4.3.14.6 Summary Comparison of Alternative Routes

Potential impacts on employment and property tax revenue would be similar in nature for all alternative routes in Segment 1. However, Alternatives 1B: Dry Piney and 1C: Figure Four would result in reduction in property values for about 7 miles and 3 miles, respectively, where the proposed H_2S pipeline crosses private property.

Potential impacts on all aspects of social and economic conditions for alternative routes located within Segments 2 and 3 would be similar in nature.

4.3.15 Soils and Reclamation

4.3.15.1 Issues Identified for Analysis

Issues raised during agency and public scoping related to potentially significant effects on soil and reclamation resources include:

- Potential impacts on nonsensitive and sensitive soils (i.e., highly erodible or fragile soils and soils susceptible to erosion and compaction)
- Reclamation success on sensitive and nonsensitive soils
- Using topsoil segregation methods during construction and replacing the topsoil during reclamation

4.3.15.2 Types of Potential Effects

Impacts on soil resources resulting from the Project are associated with ground-disturbing activities that could potentially result in the removal or mixture of the surface soil horizons, loss of soil-stabilizing vegetation, compaction of soils, or loss of soil due to accelerated erosion.

Pipeline construction activities, such as clearing, grading, trench excavation, backfilling, heavy equipment traffic, and restoration, could result in impacts on soil resources along the construction right-of-way, in temporary work areas, and on new and improved access roads. Clearing would remove protective vegetation cover and would expose soils to the effects of wind, sun, and precipitation, which could potentially increase soil erosion and the transport of sediment to sensitive areas, such as wetlands or waterbodies. Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.15.3 Criteria for Assessing Impacts

Criteria were developed to assess the intensity of a potential effect on soil resources associated with implementation of the Project (Table 4-98). These criteria were based on susceptibility of soils to water and wind erosion, reclamation potential, and potential impacts on designated Prime or Unique Farmland soils. These criteria form the baseline for determining whether impacts on soil resources would occur at a high, moderate, or low level.

Table 4-98
Criteria for Assessing Intensity of Impacts on Soil Resources

Intensity of Impacts	Description
High	▪ Soils with high susceptibility to wind or water erosion ▪ Areas designated as Unique or Prime Farmlands
Moderate	▪ Soils with 28 percent or higher clay content (compaction-prone soils) ▪ Soils with moderate susceptibility to wind or water erosion
Low	▪ Soils with less than 28 percent clay content ▪ Soils with low susceptibility to wind or water erosion

4.3.15.4 Mitigation Planning

Initial impacts are those effects resulting from the implementation of the Project, including implementation of design features of the Proposed Action for environmental protection (Table 2-18). Initial impacts were assigned using the criteria presented in Table 4-98. The specific design features of the Proposed Action for environmental protection relevant to soils and reclamation include:

- **Design Feature 5 (roads – general design).** Applied to avoid excessive grades on roads, road embankments, ditches, and drainages when possible, especially in areas with erodible soils.
- **Design Feature 6 (access roads – general design).** Applied to ensure that access roads follow natural contours where possible and minimize side hill cuts.
- **Design Feature 9 (roads reclamation).** Applied to ensure that abandoned and unused roads would be contoured and revegetated.
- **Design Feature 10 (soils – erosion control).** Applied to areas where permanent erosion-control devices would be installed during Project construction.
- **Design Feature 11 (soils – topsoil handling).** Applied to ensure that topsoil material suitable for site reclamation would be removed in conjunction with clearing and grading and would be reserved in stockpiles.
- **Design Features 12 (soils – wet soils during construction).** Applied to construction activities when soils are wet.
- **Design Feature 32 (reclamation roadways).** Applied to ensure that access roads would be regraded, topsoil would be replaced, and all disturbed areas would be revegetated.

Residual impacts represent anticipated impacts on soils and reclamation that would remain afterimplementation of agency-required mitigation measures (refer to Table 4-2). The level of potential residual impacts on soils and reclamation associated with implementation of the Project was assessed using the criteria presented in Table 4-98. The agency-required mitigation measures applied to avoid, reduce, or minimize impacts on soils and reclamation include:

- **Agency-Required Mitigation Measure 3 (minimizing or avoiding disturbance to sensitive soils and vegetation**). Applied to areas where soils are sensitive to water and wind erosion or are susceptible to compaction.
- **Agency-Required Mitigation Measure 5 (overland access). A**pplied to limit construction access to overland drive-and-crush (i.e., vegetation is crushed, but not cropped; soil is compacted, but no surface soil is removed). This mitigation measure may include access to work areas, spur roads, and wetland areas requiring crane mats for access.
- **Agency-Required Mitigation Measure 8 (interim or intense reclamation). A**pplied in those areas where disturbance of soils has decreased reclamation potential or where higher impacts on soils have been identified. This mitigation measure would include:
    - Stabilization and/or irrigation of specific areas where establishment of seedlings have been shown or are expected to be difficult
    - Intense reclamation (beyond reseeding), typically for locations where higher impacts on soil resources have been identified. This could include changing seed mixes, planting shrub/perennials, completing color treatments of exposed soil/rock, and adding amendments to soil.

Table 4-99 includes types of soils affected by the implementation of the Project, initial and residual impacts, and the agency-required mitigation measures to be used.

Table 4-99
Summary of Initial and Residual Impacts on Soils and Reclamation

Resource	Initial Impact	Agency-Required Mitigation Measure	Residual Impact
Soils with high susceptibility to wind or water erosion	High	3, 5	Low
Areas designated as Unique or Prime farmlands	High	3	Low
Soils with low reclamation potential	High	3, 8	Low
Soils with 28 percent or higher clay content (compaction-prone soils)	Moderate	3, 5	Low
Soils with moderate susceptibility to wind or water erosion	Moderate	3, 5	Low
Soils with moderate reclamation potential	Moderate	3, 8	Low
Soils with less than 28 percent clay content	Low	0	Low
Soils with low susceptibility to wind or water erosion	Low	0	Low
Soils with high reclamation potential	Low	0	Low

NOTE: Initial impacts reflect implementation of the design features of the Proposed Action for environmental protection, which are considered to be part of the Applicant's Project description (and include the Applicant-committed measures [Appendix A]). Residual impacts reflect the anticipated effects that would remain after implementation of agency-required mitigation measures.

4.3.15.5 Results (Direct and Indirect Residual Effects)

Table 4-100 presents the resource inventory and residual impact results of soil resources. Table 4-101 compares the amount of disturbance of soil resources for each alternative route, and inventory and impact results for this section are displayed on MV-9.

4.3.15.5.1 Soil Erosion and Compaction

4.3.15.5.1.1 No Action Alternative

Under the No Action Alternative, a right-of-way grant on BLM-administered lands would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.15.5.1.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction and Injection Well Sites

Potential impacts on soil resources include (1) topsoil losses from wind and water erosion on disturbed surfaces during and after construction and (2) potential reduction in soil productivity and quality

from topsoil losses, soil mixing and compaction; and 3) potential for revegetation of sols with low reclamation potential. These facilities will be located on 0.85 acres of highly erodible, shallow (to bedrock) soils. (Refer to Appendix A Resource Report 7 of the preliminary POD [included as Appendix A of this EIS]). The implementation of this mitigation would minimize the impacts on highly erodible soils present.

Table 4-100
Soils Resources Inventory Data and Residual Impacts

Alternative Route	Total Miles	Resource Inventory (miles)									Reclamation Potential (miles)[1]			Residual Impacts (miles)[2]	
		Soil Susceptibility to Water Erosion			Soil Susceptibility to Wind Erosion			Prime Farmland	Soil Clay Content					None	Low
		High	Moderate	Low	High	Moderate	Low		28 Percent or Higher (compaction-prone soils)	Less than 28 Percent	High	Moderate	Low		
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant															
1A: Proposed Action	30.4	4.4	10.7	1.0	3.1	12.6	14.5	0.0	15.9	14.5	4.4	13.9	11.9	0.0	30.4
Variation: Dry Basin Draw	30.7	4.4	10.1	1.0	2.3	14.4	13.8	0.0	15.3	15.4	4.4	11.8	14.3	0.0	30.7
1B: Dry Piney	34.5	7.9	10.1	0.7	2.8	14.3	16.4	0.0	18.8	15.7	4.6	13.1	15.8	0.0	34.5
1C: Figure Four	38.5	2.3	8.1	1.4	7.8	17.3	13.0	0.0	10.7	27.8	4.4	17.0	16.7	0.0	38.5
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect															
2A: Proposed Action	129.1	0.5	10.8	1.7	5.6	35.8	10.4	0.0	9.0	120.1	9.3	28.8	13.7	0.0	129.1
2B: Southern Route	136.2	--	13.6	1.1	3.4	15.0	21.3	0.0	8.9	127.3	9.2	12.7	17.8	0.0	136.2
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect															
3A: Proposed Action	83.2	1.8	25.1	0.2	2.9	57.3	22.0	0.0	26.9	56.3	60.4	4.6	17.2	0.0	83.2
3B: Lost Creek to Lost Cabin	73.0	3.1	23.1	1.8	9.0	49.2	14.7	0.0	21.4	51.6	51.1	3.7	17.5	0.0	73.0
3C: Lost Creek to Highway 20/26	101.4	4.3	21.8	2.1	12.6	69.9	18.6	0.0	22.3	79.1	73.8	4.0	23.0	0.0	101.4

NOTES:
[1]Based on soils that have high sodium content or pH, rock outcrops, topography, and soil texture and composition.
[2]With the implementation of agency-required mitigation measures identified for this resource, no high or moderate impacts on soils would be anticipated.

THIS PAGE INTENTIONALLY LEFT BLANK

Table 4-101
Disturbance of Soils

Alternative Route	Total Miles	Disturbance (acres)																										
		Soil Susceptibility to Water Erosion									Soil Susceptibility to Wind Erosion									Prime Farmland			Soil Clay Content					
		High			Moderate			Low			High			Moderate			Low						28 percent or higher (compaction-prone soils)			Less than 28 percent		
		Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]	Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]	Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]	Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]	Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]	Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]	Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]	Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]	Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant																												
1A: Proposed Action	30.4	54	3	28	130	8	67	12	1	6	38	2	20	154	9	79	177	10	91	0	0	0	194	11	100	177	10	91
Variation: Dry Basin Draw	30.7	54	3	28	123	7	64	12	1	6	28	2	15	175	10	91	168	10	87	0	0	0	168	10	87	188	11	97
1B: Dry Piney	34.5	95	5	50	122	7	64	8	0	4	34	2	18	172	9	90	197	11	103	0	0	0	197	11	103	189	10	99
1C: Figure Four	38.5	27	1	15	97	5	51	17	1	9	93	5	49	206	11	109	155	8	82	0	0	0	155	8	82	332	17	175
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect																												
2A: Proposed Action	129.1	7	<1	3	157	11	70	25	2	11	81	6	36	520	35	231	151	10	67	0	0	0	131	9	58	1,746	119	777
2B: Southern Route	136.2	0	0	0	197	13	88	16	1	7	49	3	22	218	15	97	309	21	138	0	0	0	129	9	57	1,847	124	822
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect																												
3A: Proposed Action	83.2	28	1	11	385	16	159	3	0	1	44	2	18	879	37	363	337	14	139	0	0	0	413	17	170	863	36	356
3B: Lost Creek to Lost Cabin	73.0	48	2	20	356	15	146	28	1	11	139	6	57	758	32	311	226	10	93	0	0	0	330	14	135	795	34	326
3C: Lost Creek to Highway 20/26	101.4	66	3	27	333	14	138	32	1	13	192	8	80	1,066	44	443	284	12	118	0	0	0	340	14	141	1,207	50	501

SOURCE: Calculations in this table are derived from information provided in the Applicant's Project description.
NOTES:
[1]Temporary disturbance includes estimated area of disturbance associated with the temporary right-of-way, ATWS, staging areas, temporary disturbance at the Riley Ridge Sweetening Plant, temporary disturbance associated with the H_2S acid gas injection wells and flowlines, and temporary disturbance associated with the 69kV transmission line.
[2]Permanent disturbance includes estimated area of disturbance associated with pipe yards, access roads outside of the permanent right-of-way, MLVs, pig L/R sites, the Riley Ridge Sweetening Plant, permanent disturbance associated with the H_2S acid gas injection wells and flowlines, the substation, and the Bairoil Valve Site Interconnect.
[3]Permanent right-of-way reclaimed includes the portion of the permanent right-of-way that will be reclaimed after construction. The disturbance in the permanent right-of-way associated with the pig L/R sites, the Riley Ridge Sweetening Plant, MLVs, and Bairoil valve site are not included
[4]Disturbance has not been associated with the distribution lines. Additional information has been requested from the Applicant.
[5]Calculations include an additional 5 percent contingency.
The cells that have an en-dash (–) indicate no data was available for that alternative route.
Acreages are approximate and have been rounded to the nearest acre.

THIS PAGE INTENTIONALLY LEFT BLANK

Where proposed project facilities would be constructed within existing, previously disturbed commercial/ industrial properties, the result would be no additional soil impacts than are already experienced at these facilities. Additional facilities would affect previously undisturbed lands. Because these sites may exist for an indeterminate amount of time, site specific impacts could result in an irretrievable reduction in soil quality and productivity. Refer to Appendix A Resource Report 7 of the preliminary POD (included as Appendix A of this EIS).

Segment 1 Pipeline Alternative Routes

Alternative 1A: Proposed Action crosses 4.4 miles of soils with high susceptibility and 10.7 miles of soils with moderate susceptibility to water erosion; 3.1 miles of soils with high susceptibility and 12.6 miles of soils with moderate susceptibility to wind erosion; and 15.9 miles of soils with high compaction potential (Table 4-100). Alternative 1A: Proposed Action would have 194 acres of temporary disturbance, 11 acres of permanent disturbance, and 100 acres of permanent right-of-way reclaimed in compaction-prone soils (Table 4-101).

Alternative 1A Variation: Dry Basin Draw crosses the same number of miles of soils with high susceptibility and 0.6 fewer miles of soils with moderate susceptibility to water erosion, 0.8 fewer miles of soils with high susceptibility and 1.8 more miles of soils with moderate susceptibility to wind erosion, and 0.6 fewer miles of soils with higher compaction potential than Alternative 1A: Proposed Action (Table 4-100). Alternative 1A Variation: Dry Basin Draw would have 26 fewer acres of temporary disturbance, 1 fewer acres of permanent disturbance, and 13 fewer acres of permanent right-of-way reclaimed for compaction-prone soils than Alternative 1A: Proposed Action (Table 4-101).

Alternative 1B: Dry Piney crosses 3.5 more miles of soils with high susceptibility and 0.6 fewer miles of soils with moderate susceptibility to water erosion, 0.33 fewer miles of soils with high susceptibility and 1.7 more miles of soils with moderate susceptibility to wind erosion and 2.9 more miles of soils with higher compaction potential than Alternative 1A: Proposed Action (Table 4-100). Alternative 1B: Dry Piney would have 3 more acres of temporary disturbance, the same number of acres of permanent disturbance, and 3 more acres of permanent right-of-way reclaimed for compaction-prone soils than Alternative 1A: Proposed Action (Table 4-101).

Alternative 1C: Figure Four crosses 2.1 fewer miles of soils with high susceptibility and 2.6 fewer miles of soils with moderate susceptibility to water erosion, 4.7 more miles of soils with high susceptibility and 4.7 more miles with moderate susceptibility to wind erosion, and 5.2 fewer miles of soils with higher compaction potential than Alternative 1A: Proposed Action (Table 4-100). Alternative 1C: Figure Four would have 39 fewer acres of temporary disturbance, 3 fewer acres of permanent disturbance, and 18 fewer acres of permanent right-of-way reclaimed for compaction-prone soils than Alternative 1A: Proposed Action (Table 4-101).

Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Alternative 2A: Proposed Action crosses 0.5 mile of soils with high susceptibility and 10.8 miles of soils with moderate susceptibility to water erosion, 5.6 miles of soils with high susceptibility and 35.8 miles of soils with moderate susceptibility to wind erosion, and 9 miles of soils with higher compaction potential (Table 4-100). Alternative 2A: Proposed Action would have 131 acres of temporary disturbance, 9 acres of permanent disturbance, and 58 acres of permanent right-of-way reclaimed for compaction-prone soils (Table 4-101). Alternative 2B: Southern Route crosses no soils with high susceptibility and 2.8 more miles of soils with moderate susceptibility to water erosion, 2.2 fewer miles of soils with high susceptibility and 20.8 fewer miles of soils with moderate susceptibility to wind erosion, and 0.1 fewer miles of soils with higher compaction potential than Alternative 2A: Proposed Action (Table 4-100). Alternative 2B: Southern Route has 2 fewer acres of temporary disturbance, of the same permanent

disturbance, and 1 fewer acres of permanent right-of-way reclaimed for compaction-prone soils than Alternative 2A: Proposed Action (Table 4-101).

4.3.15.5.1.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Alternative 3A: Proposed Action crosses 1.8 miles of soils with high susceptibility and 25.1 miles of soils with moderate susceptibility to water erosion, 2.9 miles of soils with high susceptibility and 57.3 miles of soils with moderate susceptibility to wind erosion, and 26.9 miles of soils with higher compaction potential (Table 4-100). Alternative 3A: Proposed Action would have 413 acres of temporary disturbance, 17 acres of permanent disturbance, and 170 acres of permanent right-of-way reclaimed for compaction-prone soils (Table 4-101).

Alternative 3B: Lost Creek to Lost Cabin crosses 1.3 more miles of soils with high susceptibility and 2.0 fewer miles of soils with moderate susceptibility to water erosion, 6.1 more miles of soils with high susceptibility and 8.1 fewer miles of soils with moderate susceptibility to wind erosion, and 5.5 fewer miles of soils with higher compaction potential than Alternative 3A: Proposed Action (Table 4-100). Alternative 3B: Lost Creek to Lost Cabin would have 83 fewer acres of temporary disturbance, 3 fewer acres of permanent disturbance, and 35 fewer acres of permanent right-of-way reclaimed for compaction-prone soils than Alternative 3A: Proposed Action (Table 4-101).

Alternative 3C: Lost Creek to Highway 20/26 crosses 2.5 more miles of soils with high susceptibility and 3.3 fewer miles of soils with moderate susceptibility to water erosion, 9.7 more miles of soils with high susceptibility and 12.6 more miles of soils with moderate susceptibility to wind erosion, and 4.6 fewer miles of soils with higher compaction potential than Alternative 3A: Proposed Action (Table 4-100). Alternative 3C: Lost Creek to Highway 20/26 would have 73 fewer acres of temporary disturbance, 3 fewer acres of permanent disturbance, and 29 fewer acres of permanent right-of-way reclaimed for compaction-prone soils than Alternative 3A: Proposed Action (Table 4-101).

4.3.15.5.1.4 230-Kilovolt Transmission Line

The 230kV transmission line crosses an area having soils with moderate susceptibility to wind erosion and low susceptibility to water erosion.

4.3.15.5.1.5 Mainline Valve Distribution Lines

The MLV distribution lines are expected to result in temporary and permanent disturbance to soil resources. Without knowing the location of these distribution lines, the amount of impact resulting from construction of these distribution lines cannot be provided at this time. The poles for these lines are proposed to be approximately 250 feet apart and have a twenty-foot by twenty-foot temporary area of disturbance. It is estimated that there will be 1.1 miles of 12-foot-wide access roads for every 1 mile of distribution lines. These access roads would be reclaimed. An above-ground line could have fewer impacts on soil resources than an alternative buried line.

The design features of the Proposed Action for environmental protection and agency-required mitigation measures to reduce impacts associated with construction of the Proposed Action on soil resources would be followed for the distribution lines.

4.3.15.5.2 Prime Farmland Soils

No prime or unique farmlands are crossed by alternative routes; thus, prime farmlands would not be affected by the Project.

4.3.15.5.3 Hydric Soils

Soil types that typically have a saturated condition include aqualfs (wet alfisols), aquents (wet entisols), wassents (entisols), and aquolls (wet mollisols). Aqualfs are typically saturated close to the surface by groundwater for long periods of time and can be found in floodplains, depressions, and broad flats. Aquents are saturated close to the surface for long periods of time and are commonly found in wetlands, tidal marshes, deltas, margins of lakes, floodplains, and areas of wet sandy deposits. Wassents form in shallow, permanently flooded environments and form in coastal saltwater environments and freshwater deposits. Aquolls develop in low areas where water collects and stands, or in broad flats.

Less than 1 percent of the soils in Segments 1, 2, and 3 are considered to be hydric soils.

4.3.15.5.4 Revegetation and Reclamation

In this assessment, reclamation potential refers to the potential for reclamation success and is based on soils that have a high sodium content or pH, rock outcrops, topography, and soil texture and composition. In general, those soils with high reclamation potential would require less mitigation to avoid soil loss and higher potential for reclamation success; conversely, soils with low reclamation potential would potentially require greater mitigation to avoid soil loss and associated effects and would have lower potential for reclamation success. Table 4-100 presents the estimated reclamation potential by alternative route.

4.3.15.5.4.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction and Injection Well Sites

No soils with low reclamation potential are present at the sites for these facilities. Thus, no impacts on revegetation or reclamation potential would be anticipated. Refer to Appendix A Resource Report 7 of the preliminary POD (included as Appendix A of this EIS).

Segment 1 Pipeline Alternative Routes

In Segment 1, the reclamation potential associated with the pipeline along Alternative 1A: Proposed Action and 1A Variation: Dry Basin Draw would be similar in terms of soils affected that have moderate or low reclamation potential that would require more mitigation to avoid soil loss. Alternatives 1B: Dry Piney and 1C: Figure 4 cross the greatest amount of soils with moderate and low reclamation potential and would require the most mitigation to avoid soil loss and achieve reclamation success. However, with the appropriate mitigation and monitoring to ensure reclamation success, impacts on soils would be anticipated to be similar between the alternative routes considered.

4.3.15.5.4.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

In Segment 2, Alternative 2A: Proposed Action crosses less soil with low reclamation potential but is a longer route than Alternative 2B: Southern Route. Overall, Alternative 2A: Proposed Action crosses 12 more miles of soils with low and moderate reclamation potential that would require more mitigation to avoid soil loss and achieve reclamation success. However, with the appropriate mitigation and monitoring to ensure reclamation success, impacts on soils would be anticipated to be similar between Alternatives 2A: Proposed Action and 2B: Southern Route.

4.3.15.5.4.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Overall, in Segment 3, Alternative 3C: Lost Creek to Highway 20/26 crosses 5.0 more miles of soils with low and moderate reclamation potential that would require more mitigation to avoid soil loss and achieve reclamation success. Alternatives 3A: Proposed Action and 3B: Lost Creek to Lost Cabin cross a similar number of miles of soils with low and moderate reclamation potential and, relative to the overall length of the alternative route, a similar number of miles of soils with high reclamation potential. Alternative 3B: Lost Creek to Lost Cabin is 10.2 miles shorter, which is preferable in terms of reclamation success.

4.3.15.5.5 Summary Comparison of Alternative Routes

In Segment 1, Alternative 1A: Proposed Action would result in the least amount of permanent and temporary disturbance to soils with moderate and high susceptibility to wind erosion. Alternative 1A: Proposed Action and the 1A Variation: Dry Basin Draw cross fewer soils with moderate or low reclamation potential (approximately 7 miles less than Alternative 1C: Figure 4) that would require more mitigation to avoid soil loss and achieve reclamation success. Also, Alternative 1A: Proposed Action is the shortest route considered in this segment, which is preferable in terms of reclamation success.

In Segment 2, Alternative 2A: Proposed Action would result in a greater amount of disturbance to soils with a high susceptibility to water and wind erosion than Alternative 2B: Southern Route but would have less disturbance of soils with moderate susceptibility to water and wind erosion); and compaction potential would be similar between the two alternative routes. Compared to Alternative 2B: Southern Route, Alternative 2A: Proposed Action crosses 12 more miles of soils with low and moderate reclamation potential that would require more mitigation to avoid soil loss and achieve reclamation success.

In Segment 3, Alternative 3A: Proposed Action would result in the least amount of permanent and temporary disturbance to soils with moderate and high susceptibility to water and wind erosion but would result in a greater amount of disturbance to soils with higher compaction potential. Alternative 3B: Lost Creek to Lost Cabin would result in the least amount of disturbance to soils with high compaction potential. In terms of reclamation potential, Alternatives 3A: Proposed Action and 3B: Lost Creek to Lost Cabin cross a similar number of miles of soils with low and moderate reclamation potential and, relative to the overall length of the alternative route, a similar number of miles of soils with high reclamation potential. Alternative 3B: Lost Creek to Lost Cabin is 10.2 miles shorter, which is preferable in terms of reclamation success.

4.3.16 Special Designations

The potential effects of the Project on ACECs, WSAs, and other management areas are discussed in this section.

4.3.16.1 Issues Identified for Analysis

Issues identified during the scoping process include:

- Potential impacts on relevant and important values and management of ACECs
- Potential impacts on the wilderness attributes of the Big Sandy Foothills, Jack Morrow Hills, and other WSAs
- Potential impacts on other management areas, including the Red Desert Watershed

4.3.16.2 Types of Potential Effects

The construction, operation, and maintenance of the Project would result in both direct and indirect adverse effects on special designations. Direct effects associated with construction, operation, and maintenance activities could include the following:

- Construction activities could conflict with management prescriptions and experience of a special designation area (short-term) (e.g., introduction of noise, introduction of new access, and temporary displacement of wildlife [or other resources])
- Presence of the permanent pipeline facilities (e.g., MLVs, pig launchers, etc.) could conflict with management prescriptions for a designation (long term)

Indirect effects could include potential degradation of special designations as the result of increased access and detraction from aesthetic values of an area (refer to Section 4.3.19.5 for more information), which could preclude the ability for an area to be managed as prescribed. Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.16.3 Criteria for Assessing Impacts

The impact analysis for special designations is different from other resources because high, moderate, and low were not used to quantitatively assess the level of impacts, as was done for most other resources. Instead, a discussion of the number of miles that the Project alternative routes cross special designations is presented followed by a qualitative discussion (referencing high, moderate, and low impacts from the criteria listed in Table 4-102) of how this crossing may affect the management prescriptions and the relevant/important values or special characteristics that would result in an agency's ability to manage these land-use designations. Each special designation is designated and managed for a specific resource, making impacts varied for each crossing. For specific information regarding the impacts on resources in a special designation crossed by an alternative route, refer to the applicable resource section (i.e., biological resources, cultural resources, etc.).

Table 4-102
Criteria for Assessing Level of Impacts on Special Designation Resources

Level of Impacts	Description
High	▪ Areas where the Project would conflict physically and create a direct long-term conflict with specially designated areas (e.g., loss of facilities) ▪ Areas where the Project would conflict with special designation management or goals of the affected land-management agency (e.g., management of ACECs, WSAs, and other relevant and important management areas)
Moderate	▪ Areas where the Project would create an indirect or short-term conflict with a special designation (e.g., new or improved access to a special designation)
Low	▪ Areas where the Project is compatible with special designation management prescriptions

4.3.16.4 Mitigation Planning

In addition to the design features of the Proposed Action for environmental protection that are part of the Project description, agency-required mitigation measures were developed to minimize adverse impacts on special designations and other management areas. However, agency-required mitigation measures were applied specifically to the resources being protected by the special designation or other management area (i.e., biological resources, cultural resources, etc.) instead of by the special designation or other management area boundary. By applying agency-required mitigation measures by resources instead of by the special designation or other management area boundary, it is less likely that the implementation of

agency-required mitigation measures will be overestimated/overstated in the EIS (i.e., applied where an alternative route crosses the special designation or management area versus only where a particular resource is within an area). Special designations and other management area prescriptions would be honored and agency-required mitigation measures will be applied where possible to reduce any effects on these managed areas. Refer to the applicable resource section being protected by a special designation or other management area for agency-required mitigation information.

4.3.16.5 Results (Direct and Indirect Residual Effects)

Inventory and impact results for this section are displayed on MV-7. Table 4-103 outlines the miles crossed of each special designation and other management areas by alternative route.

Table 4-103
Special Designations Inventory Data

Alternative	Total Miles	Resource Inventory (miles)	
		Areas of Critical Environmental Concern	Other Management Areas
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant			
1A: Proposed Action	30.4	0.0	0.0
1A Variation: Dry Basin Draw	30.7	0.0	0.0
1B: Dry Piney	34.5	0.0	0.0
1C: Figure Four	38.5	0.0	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect			
2A: Proposed Action	129.1	0.0	29.7
2B: Southern Route	136.2	0.0	31.2
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect			
3A: Proposed Action	83.2	1.6	14.8
3B: Lost Creek to Lost Cabin	73.0	1.6	25.4
3C: Lost Creek to Highway 20/26	101.4	1.6	29.9

4.3.16.5.1 Areas of Critical Environmental Concern

4.3.16.5.1.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.16.5.1.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction and Injection Wells

The proposed Riley Ridge Sweetening Plant and injection wells are not located within or adjacent an ACEC. Therefore, no impacts are anticipated from the construction or operation of these facilities.

Segment 1 Pipeline Alternative Routes

Neither Alternative 1A: Proposed Action nor other alternative routes considered in Segment 1 cross any ACECs. Thus, no identifiable impacts are anticipated on ACECs in this segment of the Project.

4.3.16.5.1.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Neither Alternative 2A: Proposed Action nor Alternative 2B: Southern Route crosses any ACECs. Thus, no direct impacts are anticipated on ACECs in this segment of the Project. However, the Greater Sand Dunes ACEC, though not crossed by either Alternative 2A: Proposed Action or Alternative 2B: Southern Route, may be affected by being present in a portion of the 2-mile-wide study corridor for Alternative 2B: Southern Route. This ACEC is managed to protect geologic features, prehistoric and historic values of national significance, and recreation values of regional and national importance. Potential indirect effects on these resources would include improved access to the ACEC, increased spread of noxious weeds and invasive species, and degradation of the scenic qualities of the ACEC. For additional information related to the impacts on cultural resources in the Greater Sand Dunes ACEC, refer to Sections 0 and 4.3.8.

4.3.16.5.1.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Alternative 3A: Proposed Action and all other alternative routes in Segment 3 cross 1.6 miles of significant sites along the Oregon Mormon Pioneer California Pony Express NHTs, an area previously managed as an ACEC. The area is now managed as an NHT Management Corridor. Potential impacts on the National Trails Management Corridor are discussed in Section 4.3.7.5.

4.3.16.5.1.5 230-Kilovolt Transmission Line

No ACECs are in the vicinity of the 230kV transmission line components. Thus, no identifiable impacts would be anticipated.

4.3.16.5.1.6 Mainline Valve Distribution Lines

For all alternative routes, the placement of the MLV distribution lines would avoid the boundaries of the ACEC; thus, no identifiable impacts would be anticipated.

4.3.16.5.2 Wilderness Study Areas

4.3.16.5.2.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.16.5.2.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction and Injection Wells

The proposed Riley Ridge Sweetening Plant and injection wells are not located within a WSA. Therefore, no impacts are anticipated from the construction or operation of these facilities.

Segment 1 Pipeline Alternative Routes

Neither Alternative 1A: Proposed Action nor any other alternative routes considered in this segment cross any WSAs. Thus, no identifiable impacts on wilderness areas or WSAs would occur in this segment of the Project.

4.3.16.5.2.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Alternative 2A: Proposed Action does not cross any WSAs. No residual impacts are anticipated on WSAs for this alternative. No other alternative routes in Segment 2 cross WSAs. Therefore, no residual impacts are anticipated on wilderness areas or WSAs in Segment 2. However, though not crossed by either Alternative 2A: Proposed Action or Alternative 2B: Southern Route, WSAs may be indirectly affected by being present in a portion of the 2-mile-wide study corridor. Alternative 2A: Proposed Action skirts the Alkali Draw WSA.

Alternative 2B: Southern route are located close to the Sand Dunes WSA but does not enter the WSA. This alternative also has the Alkali Draw WSA, South Pinnacles WSA, Alkali Basin/East Sand Dunes WSA, and Buffalo Hump WSA within the 2-mile-wide study corridor, but does not enter any of these WSAs. The relevant and important values of these WSAs vary but include recreation, scenery, archaeology, hunting, ecology, geology, education, science, history, and rock hounding. Potential indirect impacts on these values include impacts on scenery during construction and reclamation. Also, there is potential for decreased access during construction, with long-term improved access for recreationists and hunters.

4.3.16.5.2.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Alternative 3A: Proposed Action does not cross any WSAs. No residual impacts are anticipated on WSAs for this alternative. No other alternative routes in Segment 3 cross WSAs. Therefore, no residual impacts are anticipated on WSAs in Segment 3.

4.3.16.5.2.5 230-Kilovolt Transmission Line

No WSAs are in the vicinity of the 230kV transmission line components; thus, no identifiable impacts would be anticipated.

4.3.16.5.2.6 Mainline Valve Distribution Lines

For all alternative routes, the siting of MLV distribution lines would avoid WSA boundaries; thus, no identifiable impacts would be anticipated.

4.3.16.5.3 Other Management Areas

4.3.16.5.3.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.16.5.3.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant and Injection Wells

The proposed Riley Ridge Sweetening Plant and injection wells are not located within any management areas. Therefore, no impacts are anticipated from the construction or operation of these facilities.

Segment 1 Pipeline Alternative Routes

Alternative 1A: Proposed Action does not cross any other management areas. No residual impacts are anticipated on other management areas for this alternative. No other alternative routes or route variation

in Segment 1 cross other management areas. Therefore, no residual impacts are anticipated on other management areas in Segment 1.

4.3.16.5.3.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Alternative 2A: Proposed Action crosses 29.8 miles of other management areas. These include the:

- Steamboat Mountain Management Area (less than 0.1 mile)
- Red Desert Watershed Management Area (29.7 miles)

Alternative 2A: Proposed Action crosses less than 0.1 mile of the Steamboat Mountain Special Management Area. Management objectives for this area, as indicated in the Rock Springs RMP and Jack Morrow Hills CAP, focus on protecting heritage resources and enhancing water quality, vegetation, soil, and wildlife resources, including crucial big game habitat. Through construction and operations disturbance associated with the Project, Alternative 2A: Proposed Action directly could affect the soil, water, vegetation, and wildlife resources for which the management area is managed to protect. Refer to Sections 4.3.15.5, 4.3.18.5, 4.3.20.4, and 4.3.23.5 for a detailed discussion of impacts on these resources and mitigation measures applied. However, management does not preclude pipelines from crossing the Steamboat Mountain Management Area. Per the Jack Morrow Hills CAP, right-of-way crossings are assessed on a case-by-case basis. Direct impacts on the management of Steamboat Mountain would be related to construction and would be short term and moderate.

Alternative 2A: Proposed Action crosses the Red Desert Watershed Management Area. Management objectives for this area focus on protection of visual resources, watershed values, and wildlife resources. Therefore, Alternative 2A: Proposed Action would have short-term impacts on the visual and wildlife resources for which the management area is managed to protect during Project construction and until restoration is complete. For discussion of these impacts and mitigation measures applied, refer to Section 4.3.19.4 and Section 4.3.23.4. Rights-of-way are considered if in conformance with management objectives. Only below-ground facilities are permitted anywhere in the management area and the BLM assumes no overhead facilities would be placed in the management area.

Alternative 2B: Southern Route crosses 31.3 miles of other management areas. These include the:

- Red Desert Watershed Management Area (23.3 miles)
- West Sand Dunes Archaeological District (6.9 miles)
- Boars Tusk area (1.0 mile)

Impacts on the Red Desert Watershed Management Area would be similar to those discussed in Alternative 2A: Proposed Action.

The West Sand Dunes Archaeological District's management objectives are for multiple use, including archaeology, education, and interpretation, in addition to natural gas and other resources. It is an avoidance area for rights-of-way. However, it is open to considering grants of rights-of-way, but only after site-specific analysis demonstrates that area objectives can be met. New utility rights-of-way, to the extent possible, would coincide with existing roads or other rights-of-way. Therefore, Alternative 2B: Southern Route could potentially affect the archaeological resources in the management area. However, agency-required mitigation measures applied would inventory sites and avoid sensitive areas. Refer to Section 0 for further discussion of impacts associated with archaeological resources in the West Sand Dunes Archaeological District. Impacts on the West Sand Dunes Archaeological District would be short-term, moderate, and related to construction disturbances.

The Boars Tusk area is managed to protect natural and geologic values. It is a right-of-way avoidance area with surface-disturbing activities prohibited in the area unless such activity would enhance management of the geologic features. Therefore, Alternative 2B: Southern Route would directly affect the special designation management and impacts would be high, with construction disturbance occurring inside the management area and conflicting with management prescriptions. However, Agency-Required Mitigation Measure 1, Sensitive Resource Avoidance, would be applied to the extent possible to avoid or minimize potential effects on the natural and geologic values of the Boars Tusk area. The Applicant would work with the BLM to avoid the management area to the extent possible if this route were selected for construction.

4.3.16.5.3.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Alternative 3A: Proposed Action crosses 14.8 miles of other management areas. These include the:

- Designated Development Area (14.8 miles)

The Designated Development Area is managed for intensive mineral exploration, development, and production and is a designated right-of-way corridor in the Lander Field Office. The area facilitates oil and gas development. Alternative 3A: Proposed Action is compatible with the management objectives of the Designated Development Area, and effects are low.

Alternative 3B: Lost Creek to Lost Cabin crosses 25.8 miles of other management areas. These include:

- Designated Development Area (25.8 miles)

Alternative 3B: Lost Creek to Lost Cabin crosses an additional 10.4 miles of the Designated Development Area more than Alternative 3A: Proposed Action. However, the Project is compatible with the management objectives of the Designated Development Area, and effects would be low.

Alternative 3C: Lost Creek to Highway 20/26 crosses 29.9 miles of other management areas. These include:

- Designated Development Area (23.8 miles)
- Wind River Management Area (6.1 miles)

Alternative 3C: Lost Creek to Highway 20/26 crosses the Wind River Management Area and Designated Development Areas. These management areas in the Casper Field Office facilitate oil and gas development. The Project is compatible with the development objectives of the Wind River Basin Management Area and effects on the management of the areas are low.

4.3.16.5.3.5 230-Kilovolt Transmission Line

No other management areas are located within the vicinity of the 230kV transmission line components; thus, no identifiable impacts would be anticipated.

4.3.16.5.3.6 Mainline Valve Distribution Lines

The construction, operation, and maintenance of the MLV distribution lines would result in both direct and indirect adverse effects on the management of other management areas. Potentially affected areas include:

- Steamboat Mountain Management Area
- Red Desert Watershed Management Area

- West Sand Dunes Archaeological District
- Boars Tusk area
- 2 Designated Development Areas
- Wind River Management Area

Of the other management areas potentially affected, the MLV distribution lines would be compatible with the management of three of the areas (Wind River Management Area and the two designated development areas). The Red Desert Watershed Management Area permits below-ground facilities only. The Steamboat Mountain Management Area, the West Sand Dunes Archaeological District, and the Boars Tusk area are right-of-way avoidance areas. Impacts on the management of these areas could be minimized through burial of the distribution line or solar power at the MLV. Burying the lines would eliminate the above-ground facilities, thereby permitting the distribution lines in the Red Desert Watershed. For the right-of-way avoidance areas, burying the lines or using solar power would reduce impacts on the relevant and important values for which the management areas are managing (recreation, scenery, wildlife viewing, hunting, archaeology, education, history, geology, and ecology). Solar power would reduce surface disturbance, thereby preserving archaeological, geologic, and ecologic resources. Burial of the distribution lines would allow reclamation of the surface for wildlife and ecological resources and remove long-term impacts on scenery and the recreational setting.

4.3.16.5.4 Conservation Easements

4.3.16.5.4.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.16.5.4.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction and Injection Wells

The proposed Riley Ridge Sweetening Plant and injection wells are not located within any conservation easements. Therefore, no impacts are anticipated from the construction or operation of these facilities.

Segment 1 Pipeline Alternative Routes

Alternative 1A: Proposed Action does not cross any conservation easements. No residual impacts are anticipated on conservation easements for this alternative. No other alternative routes or route variation in Segment 1 cross conservation easements. Therefore, no residual impacts are anticipated on conservation easements in Segment 1.

4.3.16.5.4.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Alternative 2A: Proposed Action does not cross any conservation easements. No residual impacts are anticipated on conservation easements for this alternative. No other alternative routes in Segment 2 cross conservation easements. Therefore, no residual impacts are anticipated on conservation easements in Segment 2.

4.3.16.5.4.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Alternative 3A: Proposed Action does not cross any conservation easements. No residual impacts are anticipated on conservation easements for this alternative. No other alternative routes in Segment 3 cross

conservation easements. Therefore, no residual impacts are anticipated on conservation easements in Segment 3.

4.3.16.5.4.5 230-Kilovolt Transmission Line

No conservation easements are in the vicinity of the 230kV transmission line components; thus, no identifiable impacts would be anticipated.

4.3.16.5.4.6 Mainline Valve Distribution Lines

For all alternative routes, the siting of MLV distribution lines would avoid conservation easement boundaries; thus, no identifiable impacts are anticipated.

4.3.16.6 Summary Comparison of Alternative Routes

In Segment 1, none of the alternative routes cross specially designated areas. Therefore, no identifiable impacts on special designations would be anticipated.

In Segment 2, Alternative 2A: Proposed Route crosses the Red Desert Watershed and Steamboat Mountain Management Area. Alternative 2B: Southern Route also crosses the Red Desert Watershed (for approximately 6 fewer miles). However, Alternative 2B: Southern Route also crosses the West Sand Dunes Archaeological District and Boars Tusk area. Because management prescriptions are more limiting to pipelines in the Boars Tusk area, direct effects would be greater if Alternative 2B: Southern Route were selected.

In Segment 3, the three management areas that are crossed are managed for oil and gas development. The route with the highest percentage within these management areas is preferable. Alternative 3A: Proposed Action crosses approximately 18 percent (14.8) miles within these designated areas, Alternative 3B: Lost Creek to Lost Cabin crosses approximately 35 percent (25.8 miles), and Alternative 3C: Lost Creek to Highway 20/26 crosses approximately 30 percent (29.9 miles) of these management areas. Therefore, Alternative 3B: Lost Creek to Lost Cabin uses the management area for the largest percentage of the route and would have the lowest impact on special designations.

4.3.17 Transportation and Access

4.3.17.1 Issues Identified for Analysis

The public and agencies (including BLM realty specialists, recreation planners, other agency staff, and planners and representatives from cooperating agencies) raised issues and expressed concerns during the Project scoping and data inventory phases of this EIS that are summarized below:

- Direct and indirect effects of the Project on travel management
- Impacts on sufficiency of existing roads and ability to handle anticipated increase in traffic (construction and ongoing maintenance activities)

4.3.17.2 Types of Potential Effects

General impacts associated with transportation and access include impacts on travel management, including an increase of traffic on existing roadways, delays due to construction activity, and potential impacts on roadways that require improvement to accommodate large construction equipment associated with Project activity. No new access roads are proposed, Refer to Section 2.2.1.8 for a description of the use of access roads associated with the Project.

Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.17.3 Criteria for Assessing Impacts

Criteria were developed to assess the intensity of potential effects on transportation and access associated with implementation of the Project (Table 4-104). These criteria form the baseline for determining whether impacts on transportation facilities would occur at a high, moderate, or low level.

Table 4-104
Criteria for Assessing Level of Impacts on Transportation and Access

Level of Impacts	Description
High	▪ Areas where the Project would conflict physically and/or create a direct long-term conflict with existing railroad, airport, landing strip or historic road
Moderate	▪ Areas where the Project would create a direct (short-term) and/or indirect (short- or long-term) conflict with existing federal highway, state route or county road
Low	▪ Areas where the Project would be compatible with authorized transportation facilities

4.3.17.4 Mitigation Planning

Initial impacts are those effects resulting from the implementation of the Project, including implementation of design features of the Proposed Action for environmental protection (Table 2-18). The specific design features of the Proposed Action for environmental protection relevant to transportation and access include:

- **Design Feature 5 (roads – general design).** Applied to roads on steep grades to reduce potential for vegetation loss and soil erosion.
- **Design Feature 6 (access roads – general design).** Applied to minimize visual impacts and limit ground disturbance.
- **Design Feature 7 (roads – general use).** Applied to preclude travel outside the right-of-way.
- **Design Feature 8 (road maintenance).** Applied to provide safe conditions for road use.
- **Design Feature 9 (road reclamation).** Applied to protect resources by closing roads where they are not needed after construction.
- **Design Feature 33 (reclamation public access).** Applied to provide for the repair of public roadways that have been used for Project activities.

Residual impacts represent anticipated impacts on noise levels that would remain after following implementation of agency-required mitigation measures (refer to Table 4-2). The agency-required mitigation measures applied to avoid, reduce, or minimize impacts on transportation and access include:

- **Agency-Required Mitigation Measure 1 (sensitive resource avoidance).** Applied to allow for realignment of pipeline or transmission lines to avoid or minimize impacts on resources.
- **Agency-Required Mitigation Measure 3 (minimizing or avoiding disturbance to sensitive soils and vegetation).** Applied to limit ground disturbance to reduce potential for erosion, compaction, or loss of soil-stabilizing vegetation.
- **Agency-Required Mitigation Measure 4 (blend road cuts and grading).** Applied to reduce visual contrast.
- **Agency-Required Mitigation Measure 5 (overland access).** Applied to avoid or minimize removal of surface soil and vegetation.
- **Agency-Required Mitigation Measure 9 (minimize new or improved accessibility).** Allows for closure of roads after construction to protect resources.

Table 4-105 includes types of soils affected by the implementation of the Project, initial and residual impacts, and the agency-required mitigation measures to be used.

Table 4-105
Summary of Initial and Residual Impacts on Transportation

Resource	Initial Impact	Agency-Required Mitigation Measure	Residual Impact
Transportation Crossings			
Railroad Crossing	High	1	Low
Airport Crossing	High	1	Low
Landing Strip Crossing	High	1	Low
Historic Road	High	1	Low
Roadway Crossings			
Federal Highway	Moderate	1	Low
State Route	Moderate	1	Low
County Road	Moderate	1	Low

NOTE: Initial impacts reflect implementation of the design features of the Proposed Action for environmental protection, which are considered to be part of the Applicant's Project description (and include the Applicant-committed measures [Appendix A]). Residual impacts reflect the anticipated effects that would remain after implementation of agency-required mitigation measures.

4.3.17.5 Results (Direct and Indirect Residual Effects)

Table 4-106 demonstrates the transportation facilities crossed by the Proposed Action.

Table 4-106
Transportation Resources Inventory Data and Residual Impacts

Alternative	Total Miles	Resource Inventory (miles)				Residual Impacts (miles)[1]	
		Railroad	County	State Highway	U.S. Highway	None	Low
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant							
1A: Proposed Action	30.4	0.0	0.3	0.2	0.3	29.6	0.8
1A Variation: Dry Basin Draw	30.7	0.0	0.3	0.3	0.2	29.9	0.8
1B: Dry Piney	34.5	0.0	0.2	0.3	0.2	33.8	0.7
1C: Figure Four	38.5	0.0	0.0	0.7	0.2	37.6	0.9
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect							
2A: Proposed Action	129.1	0.2	1.0	0.2	0.2	127.5	1.6
2B: Southern Route	136.2	0.2	2.2	0.2	0.2	133.4	2.8
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect							
3A: Proposed Action	83.2	0.0	0.8	0.2	0.2	82.0	1.2
3B: Lost Creek to Lost Cabin	73.0	0.2	0.0	0.3	0.4	72.1	0.9
3C: Lost Creek to Highway 20/26	101.4	0.0	0.5	0.3	0.6	100.0	1.4

NOTE: [1]With the implementation of agency-required mitigation measures identified for this resource, no high or moderate impacts would be anticipated.

4.3.17.5.1.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment would remain as it presently exists. Therefore, no identifiable impacts on travel management and roadway sufficiency would occur from construction, operation, or maintenance of the Project.

4.3.17.5.1.2 Effects Common to All Alternative Routes

Impacts on transportation and access for the Project would be low. Activities related to transportation and access would comply with special permit requirements of the WYDOT and county highway departments. The Project would require use of a combination of 164 existing public and private roads to gain access to the right-of-way during construction of the Proposed Action (refer to Section 2.2.1.7 for further detail). Table 3-106 and MV-5 show the roadway facilities that would be crossed in the Project area. Traffic delays on roads and highways intersecting the Project would be minimal. All major highway crossings would be bored; therefore, traffic interruptions would be limited to equipment and personnel crossing the road. The crossing of the pipeline under these roadway facilities would not have long-term effects on travel management or degrade the sufficiency of the roadway.

Construction of the Project would affect transportation facility access through generation of increased traffic from rail and truck transport of pipe and construction materials and from commuting by construction workers. Load limit restrictions on roads, bridges, and highways would be observed at all times to prevent surface and structural damage. Access may be temporarily delayed as a result of construction of the pipeline crossing under a roadway. Oversized loads and pipe hauling trucks would be flagged and warning signs would be attached to both the tractor and the trailer. In areas where heavy traffic is anticipated or specific traffic safety concerns arise, pipe hauling trucks would have warning vehicles both in the front and back.

The pipe and most construction material would be shipped by truck or rail to areas near Casper and points along I-80, including Wamsutter. The construction headquarters and a material staging yard would be established for the Project in Casper. The rail activity would not be great enough to adversely affect other rail traffic or highway traffic on intersecting roads to any measurable degree. Temporary increased traffic would occur on the roads within Segment 1 of the Project area. The heavy duty access roads would see an increase in larger trucks due to the transport of pipe and materials to the right-of-way during the construction periods.

The routes used would change as construction progressed along the Project route, but existing traffic levels on all major highways are sufficiently low that this incremental increase would have no appreciable effect on levels of service or travel times on area highways. Effects on traffic flows would be minor, although the increase in heavy trucks could create some queuing delays on hilly or curved road segments where passing is restricted.

Effects of traffic increases on county road traffic are difficult to quantify. Generally, existing traffic levels are very low on such roads; therefore, the overall effects on traffic flow would be minor. Traffic generated during peak construction would be approximately 75 to 100 vehicles per day per spread, most of which would be heavy trucks. Should buses be used in transporting workers, the number of vehicles per day per spread would be reduced to 40 to 50. Traffic generated during peak construction of the Riley Ridge Sweetening Plant would be approximately 80 to 100 vehicles per day, most of which would be light trucks. Approximately five of these trips would consist of heavy trucks. Traffic during Riley Ridge Sweetening Plant operations would decrease to 8 to 12 vehicles per day. An individual motorist using one of these roads regularly may experience delays, but even individual effects would be short-term, lasting no more than a few weeks on any particular road. Project-related effects on traffic accidents would be

expected to be minor. The total number of accidents in the Project area could increase approximately in proportion to the increase in travel. There is no reason to believe, however, that the vehicle accident probability, commonly expressed as the number of accidents per million vehicle miles, would increase beyond state average levels (Planning Information Corporation 1988). Increased local traffic congestion during the construction period would tend to increase accident probability above the current low levels, but an increase in the proportion of professional bus and truck drivers in overall traffic flow would tend to counter this effect (Planning Information Corporation 1988).

Operation of the Project would result in a low level of impacts on transportation and access to these facilities in the Project vicinity. Long-term traffic increases would be negligible. Occasional maintenance or repair requirements would cause activity similar to construction but only for very brief periods and generally on a much smaller scale than those that would be experienced during the construction period.

4.3.17.5.1.3 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant

Traffic associated with construction of operations of the proposed Riley Ridge Sweetening Plant would use County Road 198. Hauling equipment and materials would be done in accordance with state and local requirements. Increased heavy truck traffic would tend to accelerate deterioration of road surfaces. Use of heavy trucks and equipment would adhere to the WYDOT and county regulations for roadway and bridge sufficiency and associated restrictions regarding large equipment and weight.

Injection Wells

Potential impacts from construction and operation associated with the proposed injection wells would be the same as those discussed above for the Riley Ridge Sweetening Plant.

Segment 1 Pipeline Alternative Routes

Table 4-106 demonstrates the miles of transportation facilities crossed by Alternative 1A: Proposed Action and other alternative routes within Segment 1. Materials would be trucked from the construction headquarters in Casper to construction areas within Segment 1 of the RRNP study area. Hauling equipment and materials would be done in accordance with state and local requirements. Increased heavy truck traffic would tend to accelerate deterioration of road surfaces; however, this effect would be minimal on state and U.S. highways with roadway sufficiency to accommodate such traffic. Use of heavy trucks and equipment will adhere to the WYDOT and county regulations for roadway and bridge sufficiency and associated restrictions regarding large equipment and weight.

Access roads would receive dust abatement as described in the Fugitive Dust Control Specifications of the POD. Following modification of access roads (as needed), roadways would be returned to as good or better condition than prior to construction. Reclamation procedures would be applied to areas disturbed during construction, including the 25-foot temporary right-of-way and ATWS.

4.3.17.5.1.4 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Table 4-106 demonstrates the miles of transportation facilities crossed by Alternative 2A: Proposed Action and Alternative 2B: Southern Route within Segment 2. The crossing of the pipeline under these roadway facilities would not affect travel management or degrade the sufficiency of the roadway.

Impacts on transportation and access for Alternative 2A: Proposed Action and Alternative 2B: Southern Route in Segment 2 would be the same as the impacts discussed for Segment 1.

4.3.17.5.1.5 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Table 4-106 demonstrates the miles of transportation facilities crossed by Alternative 3A: Proposed Action and other alternative routes within Segment 3. The crossing of the pipeline under these roadway facilities would not affect travel management or degrade the sufficiency of the roadway. Impacts on transportation and access for Alternative 3A: Proposed Action and all alternative routes in Segment 3 would be the same as the impacts discussed for Segment 1.

Pipe and most construction materials would be shipped by truck or rail to areas near Casper and points along I-80, including Wamsutter. The construction headquarters and material staging yard would be established for the Project in Casper. The rail activity would not be great enough to adversely affect other rail or highway traffic on intersecting roads.

4.3.17.5.1.6 230-Kilovolt Transmission Line

The addition of the proposed 230kV line would not affect transportation or access within the study area.

4.3.17.5.1.7 Mainline Valve Distribution Lines

The addition of the proposed distribution lines would not affect transportation or access within the study area.

4.3.17.6 Summary Comparison of Alternative Routes

The nature of impacts from the Project on transportation and access would be the same for all alternative routes.

4.3.18 Vegetation

This section addresses vegetation communities, special status plant species, and noxious weeds and invasive plant species that may be affected by the Project. Wetland and Riparian vegetation communities are discussed in Section 4.3.21, which addresses issues unique to these vegetation communities.

4.3.18.1 Issues Identified for Analysis

The issues related to vegetation identified during agency and public scoping include:

- Potential direct and indirect impacts on vegetation communities
- Potential for dissemination and establishment of noxious weeds and invasive species
- Potential impacts on federally listed threatened, endangered, proposed, and candidate plant species, including:
    - Loss of individual plants or habitat by removal of vegetation from surface-disturbing activities
    - Increased dust production and deposition
    - Increased soil erosion in habitat

Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.18.2 Types of Potential Effects

Construction of the Project would result in short- and long-term direct and indirect impacts on the vegetation communities in and adjacent to the right-of-way, at the locations of ancillary facilities, and along access roads. Direct effects on vegetation resources would occur in any area where desirable

vegetation communities would be removed or damaged due to Project activities. Direct effects on vegetation resources include the removal of vegetation communities and loss of special status plant species habitat, loss of individuals, and degradation of special status plant habitat through isolation and reduction of patch size. The direct effects on vegetation would occur from disturbance or removal of vegetation as a result of the construction of the pipeline. Indirect effects on vegetation resources would occur in any area where desirable vegetation communities or special status plant species habitat would be degraded as a result of Project activities. Indirect effects on vegetation resources include the introduction of noxious weeds, altered hydrologic regimes, excessive erosion or dust deposition, and a decrease in attractiveness to pollinators.

Because removal of vegetation increases the likelihood of soil erosion and colonization by invasive species, revegetation of vegetation communities would occur in areas of surface disturbance. Rehabilitation of surface disturbance areas on vegetation communities to a predisturbance state in a high, open, and arid ecosystem could have variable results that are dependent on climate factors and anthropogenic management to increase success. Alterations to soil structure, chemistry, nutrients, hydrology, and species composition following surface disturbances often cause ecosystems to enter into an alternate stable community unlike historic or preferred conditions (Hobbs et al. 2009).

Temporary removal of native vegetation would occur with construction in the pipeline right-of-way, ancillary features, and improved or new access roads. As proposed, areas cleared of native vegetation would be revegetated with native or desirable species, many of which would be existing components of the present communities. However, direct effects on vegetation resources could persist long term, as many species and vegetation communities take decades to mature. Additionally, portions of vegetation communities would be permanently altered or removed through construction of access roads and ancillary facilities.

Indirect effects of construction activities would result from increased vehicle and construction equipment use on new and improved access roads and surface disturbance areas along the right-of-way of the selected route. An increase in vehicle or equipment use would increase the potential for distribution of invasive and noxious weeds. In general, seeds could be transported by Project vehicles by (1) being attached to the vehicles themselves, (2) being mixed in with mud or soil attached to the vehicles and equipment, and (3) potentially being mixed in with mulch/hay and weed-free seed mixes (refer to Section 2.2.3) used to reclaim disturbed areas. Indirect effects on vegetation resources from weed invasion may continue long term, as several weed species have the ability to form persistent alternate communities (Hobbs et al. 2009, Miller et al. 2013).

Other indirect effects on vegetation resources could include a decrease in pollinator movement between communities, which could affect the reproduction of plants near construction activities. Similarly, dust deposition reduces pollinator effectiveness as well as inhibits photosynthetic activities (Farmer 1993). Both of these effects are only expected to occur during Project construction and are not expected to persist long term. Other indirect effects, including excessive erosion and altered hydrologic regimes, however, could continue beyond Project construction and persist long term.

4.3.18.3 Criteria for Assessing Impacts

Criteria were developed in collaboration with the agency interdisciplinary team to assess the level of potential effects on vegetation resources and federally listed or candidate plants associated with the Project and to compare the impacts among the segments and alternative routes (Table 4-107 and Table 4-108). For vegetation resources, impact criteria are based on considerations of the relative abundance of each vegetative community type and the nature of potential impacts.

Table 4-107 Criteria for Assessing Level of Impacts on Vegetation Resources	
Level of Impacts	**Description**
High	▪ Permanent loss or conversion of vegetation communities that are rare, regenerate slowly, and would require substantial modification of vegetation during construction ▪ Permanent loss or conversion of vegetation communities crucial for ecosystem function and biodiversity
Moderate	▪ Permanent loss or conversion of uncommon native vegetation communities ▪ Disturbance to common native vegetation communities that regenerate slowly ▪ Temporary disturbance to rare vegetation communities
Low	▪ Temporary disturbance to uncommon native vegetation communities ▪ Permanent loss or conversion of common vegetation communities ▪ Disturbance to vegetation communities that regenerate rapidly or are not a component of the natural landscape

Table 4-108 Criteria for Assessing Level of Impacts on Federally Listed or Candidate Plants	
Level of Impacts	**Description**
High	▪ Impacts that would severely limit the long-term sustainability of populations (e.g., impacts on only known population) ▪ Loss of or negative impacts on occupied habitat or large portions of suitable habitat for local species ▪ Loss or adverse modification of designated critical habitat
Moderate	▪ Impacts that would have adverse effects on species but would not severely limit the long-term sustainability of populations (e.g., impacts on plant populations somewhat more widely distributed than local species) ▪ Loss of or negative impacts on small portions of unoccupied suitable habitat for local species
Low	▪ Impacts that would have only minor adverse effects on species and would not limit the long-term sustainability of populations (e.g., indirect effects or impacts in areas of preexisting disturbance) ▪ Indirect effects or disturbance in areas of preexisting disturbance

4.3.18.4 Mitigation Planning

Initial impacts are those effects resulting from the implementation of the Project, including implementation of design features of the Proposed Action for environmental protection (Table 2-18). Initial impacts were assigned using the criteria for assessing impacts (Table 4-107 and Table 4-108). The specific design features of the Proposed Action relevant to vegetation resources and special status plants include:

- **Design Feature 4 (sensitive plant species survey).** Conducted to generate professional recommendations for mitigation and/or conservation measures to protect the species. The resulting mitigation and/or conservation measures would be incorporated into the POD.
- **Design Feature 13 (vegetation – noxious weeds).** Applied to avoid, reduce, and/or minimize the potential for spread of noxious weeds. Application of this design feature is described in Appendix L – Noxious Weed Management Plan of the POD (Appendix A).
- **Design Feature 14 (vegetation – general maintenance).** Applied to avoid, reduce, and/or minimize the potential for spread of invasive species. Application of this design feature is described in Appendix L of the POD (Appendix A).

Residual impacts represent anticipated impacts on vegetation communities and special status plants that would remain after implementation of agency-required mitigation measures (refer to Table 4-2). The level of potential residual impacts on vegetation communities is identified in Table 4-109. Agency-required mitigation measures considered in the analysis for vegetation and special status plant resources would be included in the Project POD and applied during construction, operation, and maintenance of the Project. The agency-required mitigation measures applied to avoid, reduce, or minimize impacts on vegetation communities and special status plants include:

- **Agency-Required Mitigation Measure 1 (sensitive resource avoidance).** Applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route (micro-site), or apply alternative construction techniques.
- **Agency-Required Mitigation Measure 3 (minimizing construction on greater slopes). A**pplied to prevent soil loss in areas where slopes are between 15 and 24 percent.
- **Agency-Required Mitigation Measure 7 (seasonal restrictions).** Applied to avoid surface-disturbing or disruptive activities associated with construction, operation, and maintenance of the Project during sensitive periods for plants.
- **Agency-Required Mitigation Measure 8 (interim and intense reclamation). A**pplied following construction to rectify the effects of construction by repairing, rehabilitating, or restoring the vegetation communities.

Table 4-109 and Table 4-110 include the vegetation resources and special status plants potentially affected by the implementation of the Project. The tables also include the initial and residual impacts on affected resources and plants, as well as the agency-required mitigation measures applied to reduce those impacts.

Table 4-109
Summary of Initial and Residual Impacts by Vegetation Community

Resource	Initial Impact	Agency-Required Mitigation Measures Applied	Residual Impact
Barren/Sparsely Vegetated (less than 10 percent cover)	Low	–	Low
Big Sagebrush	Moderate	8[1]	Moderate
Developed/Disturbed	Low	–	Low
Grassland	Low	–	Low
Limber Pine-Juniper	Moderate	–	Moderate
Shrub Steppe	Moderate	8[1]	Moderate

NOTES:
[1]Intensive reclamation would be required for these vegetation communities in sage-grouse PHMA
The cells that have an en-dash (–) indicate no agency-required mitigation measures are expected to be applied.

Table 4-110
Summary of Initial and Residual Impacts for Special Status Plants

Resource	Initial Impact	Agency-Required Mitigation Measures Applied	Residual Impact
ESA Listed Species[1]			
Ute ladies'-tresses	High	1, 3, 7	Low

NOTES:
Initial impacts reflect implementation of the design features of the Proposed Action for environmental protection, which are considered to be part of the Applicant's Project description (and include the Applicant-committed measures [Appendix A]). Residual impacts reflect the anticipated effects that would remain after implementation of agency-required mitigation measures.
[1]A quantitative analysis of residual impacts was not completed for BLM-sensitive species. Effects on these species are discussed qualitatively in the sections below where applicable.

4.3.18.5 Results (Direct and Indirect Residual Effects)

4.3.18.5.1 Vegetation Communities

Implementation of any of the alternative routes would result in temporary and permanent disturbance to 8 of the 14 vegetation communities identified as being present in the study area (Refer to Table 3-109 and Table 4-111). The potential effects on vegetation communities are described in Section 4.3.18.2 and below by segment. A quantitative assessment of potential Project impacts was not performed for the communities described below and, therefore, residual impacts are described qualitatively.

4.3.18.5.1.1 No Action Alternative

Under the No Action Alternative, a right-of-way grant across BLM-administered lands would not be granted. The Project would not be developed and the environment would remain as it presently exists.

4.3.18.5.1.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction

The proposed Sweeting Plant would result in 4.3 acres of permanent disturbance and 11.3 acres of temporary disturbance in Big Sagebrush vegetation communities. Potential impacts on Big Sagebrush vegetation communities would be the same as those discussed below for the Section 1 pipeline alternative routes.

Injection Wells

The injection wells would result in 7.9 acres of permanent disturbance and 4.0 acres of temporary disturbance in Big Sagebrush vegetation communities. Potential impacts on Big Sagebrush vegetation communities would be the same as those discussed below for the Segment 1 pipeline alternative routes.

Segment 1 Pipeline Alternative Routes

All alternative routes in Segment 1 would result in disturbance to all vegetation communities potentially affected by the Project, except for Limber Pine-Juniper vegetation communities, which are not crossed by any alternative in Segment 1 (Table 4-111). The extent of disturbance would be similar among alternative routes. For all alternative routes, the majority of disturbance would occur in Big Sagebrush and Shrub-Steppe vegetation communities (Table 4-111).

Disturbance in Big Sagebrush or Shrub-Steppe vegetation communities is anticipated to result in moderate residual impacts, as disturbance to these slow-growing vegetation communities could take decades to recover to predisturbance conditions (Table 4-107). Agency-Required Mitigation Measure 8

(interim and intense reclamation) would be applied where these communities are in greater sage-grouse PHMA and will likely reduce residual impacts. However, this mitigation measure would not be applied in all Big Sagebrush or Shrub-Steppe vegetation communities, and moderate residual impacts would still occur. In areas where all alternative routes result in disturbance to non-native vegetation communities or vegetation communities where recovery could occur in a shorter time-span, low residual impacts are anticipated (Table 4-109).

4.3.18.5.1.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Segment 2 is located entirely within the Wyoming Basin Ecoregion. Both Alternative 2A: Proposed Action and Alternative 2B: Southern Route cross the same vegetation communities as Segment 1 and would result in similar types of disturbance to and impacts on vegetation communities (Table 4-111).

4.3.18.5.1.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Similar to the alternative routes in Segments 1 and 2, the majority of disturbance in Segment 3 would occur in Big Sagebrush and Shrub-Steppe vegetation communities and would result in similar types of disturbance to vegetation communities.

Alternative 3C: Lost Creek to Highway 20/26 crosses a greater extent of Developed/Disturbed vegetation communities where Project impacts are expected to be minimal. Impacts on other vegetation communities for this alternative would be comparable to the impacts for the other alternative routes. Alternative 3A: Proposed Action is the only alternative in Segment 3 to result in disturbance to Limber Pine-Juniper vegetation communities. Where disturbance is expected to Limber Pine-Juniper vegetation communities, moderate residual impacts are expected due to the long time-span required for this vegetation community to recover from disturbance (Table 4-109).

4.3.18.5.1.5 230-Kilovolt Transmission Line

The construction of a 230kV transmission line to the proposed Riley Ridge Sweetening Plant would cross Big Sagebrush vegetation communities only and, therefore, is anticipated to result in moderate residual impacts on vegetation communities. The disturbance associated with the 230kV line has been included in the estimated disturbance to vegetation communities presented in Table 4-111.

4.3.18.5.1.6 Mainline Valve Distribution Lines

The MLV distribution lines are expected to result in temporary and permanent disturbance to vegetation communities crossed. Without knowing the final location of the distribution lines, the amount of disturbance by vegetation community resulting from the construction of the distribution lines cannot be provided at this time. However, estimates of disturbance resulting from distribution line construction have been incorporated into the expected amounts of temporary and permanent disturbance to vegetation communities presented in Table 4-111.

Application of design features and agency-required mitigation measures to reduce impacts associated with construction of the distribution lines would be consistent with that described for the Proposed Action. In addition, where the distribution lines would cross sensitive vegetation communities, the MLV may instead be powered through an on-site solar power system, which would effectively limit the amount of expected disturbance.

Table 4-111
Disturbance to Vegetation Communities

Alternative	Total Miles	Vegetation Communities Disturbed (acres)																	
		Barren/Sparse Vegetation (less than 10 percent cover)			Big Sagebrush			Developed/ Disturbed			Grassland			Limber Pine-Juniper			Shrub-Shrub Steppe		
		Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]	Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]	Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]	Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]	Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]	Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant																			
1A: Proposed Action	30.4	2	0	1	235	14	122	6	0	3	7	0	4	0	0	0	110	6	57
1A Variation: Dry Basin Draw	30.7	2	0	1	237	14	123	6	0	3	12	1	6	0	0	0	106	6	55
1B: Dry Piney	34.5	4	0	2	229	12	120	17	1	9	5	0	3	0	0	0	146	8	76
1C: Figure Four	38.5	4	0	2	198	10	105	23	1	12	5	0	3	0	0	0	218	11	115
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect																			
2A: Proposed Action	129.1	49	3	22	874	60	389	3	<1	1	4	<1	2	0	0	0	927	63	413
2B: Southern Route	136.2	251	17	112	856	57	381	3	<1	1	0	0	0	0	0	0	833	56	371
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect																			
3A: Proposed Action	83.2	37	2	15	913	38	377	41	2	17	0	0	0	14	1	6	239	10	99
3B: Lost Creek to Lost Cabin	73.0	74	3	30	752	32	309	34	1	14	0	0	0	0	0	0	245	10	101
3C: Lost Creek to Highway 20/26	101.4	70	3	29	677	28	281	635	26	263	0	0	0	0	0	0	142	6	59

SOURCE: Calculations in this table are derived from information provided in the Applicant's Project description.
NOTES:
[1]Temporary disturbance includes estimated area of disturbance associated with the temporary right-of-way, ATWS, and staging areas; temporary disturbance at the Riley Ridge Sweetening Plant, temporary disturbance associated with the H_2S acid gas injection wells and flowlines; and temporary disturbance associated with the 69kV transmission line.
[2]Permanent disturbance includes estimated area of disturbance associated with pipe yards, access roads outside of the permanent right-of-way, MLVs, pig L/R sites, and the Riley Ridge Sweetening Plant and permanent disturbance associated with the H_2S acid gas injection wells and flowlines, the substation, and the Bairoil Valve Site Interconnect.
[3]Permanent right-of-way reclaimed includes the portion of the permanent right-of-way that will be reclaimed after construction. The disturbance in the permanent right-of-way associated with the pig L/R sites, the Riley Ridge Sweetening Plant, MLVs, and Bairoil valve site are not included.
[4]Disturbance has not been associated with the distribution lines. Additional information has been requested from the Applicant.
[5]Calculations include an additional 5 percent contingency.
Acreages are approximate and have been rounded to the nearest acre.

THIS PAGE INTENTIONALLY LEFT BLANK

4.3.18.5.2 Special Status Plant Species

Occurrence data for the only ESA-listed plant species, Ute ladies'-tresses, indicates that this plant does not occur in any of the segments (MV-10); however, WYNDD modeled habitat for Ute ladies'-tresses is crossed by all alternative routes in Segment 3, and Ute ladies'-tresses AOI are crossed by all alternative routes in all three segments (Table 4-112). Project activities in Ute ladies'-tresses AOI could result in indirect effects on Ute ladies'-tresses, including noxious weed invasion, alteration of hydrologic regimes, and increased sediment deposition. These potential effects on Ute ladies'-tresses are discussed in greater detail in Section 4.3.18.2.

Table 4-112
Special Status Plant Species Residual Impacts

Alternative	Total Miles	Ute Ladies'-Tresses Modeled Habitat	Residual Impacts (miles)[1]	
			None	Low
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant				
1A: Proposed Action	30.4	0.0	30.4	0.0
1A Variation: Dry Basin Draw	30.7	0.0	30.7	0.0
1B: Dry Piney	34.5	0.0	34.5	0.0
1C: Figure Four	38.5	0.0	38.5	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect				
2A: Proposed Action	129.1	0.0	129.1	0.0
2B: Southern Route	136.2	0.0	136.2	0.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect				
3A: Proposed Action	83.2	0.6	82.6	0.6
3B: Lost Creek to Lost Cabin	73.0	0.6	72.4	0.6
3C: Lost Creek to Highway 20/26	101.4	0.6	100.8	0.6

NOTES: [1]With the implementation of agency-required mitigation measures identified for this resource, no high or moderate impacts would be anticipated.

4.3.18.5.2.1 No Action Alternative

Under the No Action Alternative, a right-of-way grant across BLM-administered lands would not be granted. The Project would not be developed and the environment would remain as it presently exists.

4.3.18.5.2.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

WYNDD modeled habitat for several BLM sensitive plant species is crossed by all alternative routes in Segment 1 (Table 3-113). In addition to the species listed in Table 3-113, two BLM sensitive species, Beaver Rim phlox and Trelease's racemose milkvetch, have mapped occurrences within the 1-mile study area. If the Project crosses habitat occupied by sensitive plant species, the direct and indirect effects described in Section 4.3.18.2 may occur. Residual impacts on BLM sensitive plant species are anticipated to be low as a result of design features of the Proposed Action and application of agency-required mitigation measures. Preconstruction surveys would be conducted prior to any ground-disturbing activities to identify locations of special status plants within the Project area, as well as guide further mitigation efforts to reduce impacts on special status plant species. Mitigation efforts could include reducing the width of the right-of-way, seasonal restrictions, actions to reduce erosion and sediment deposition, and intensive reclamation.

In Segment 1, no alternative routes cross modeled Ute ladies'-tresses habitat, and, therefore, residual impacts are not anticipated (Table 4-112). However, all alternative routes cross Ute ladies'-tresses AOI

and are expected to result in disturbance in these areas. Design features of the Proposed Action that reduce the risk of noxious weed invasion and limiting changes to hydrology or sedimentation are anticipated to prevent indirect effects on Ute ladies'-tresses. Of the four alternative routes in Segment 1, Alternative 1C: Figure Four would result in the greatest disturbance to Ute ladies'-tresses AOI, as it crosses approximately 3.0 more miles of AOI than the least impactful alternative route, Alternative 1B: Dry Piney (Table 3-110).

4.3.18.5.2.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

WYNDD modeled habitat for several BLM sensitive plant species is crossed by all alternative routes in Segment 2 (Table 3-113). The types of potential effects and the application of mitigation measures to reduce impacts on BLM sensitive plants would be similar to the effects and application of mitigation measures described for Segment 1.

In Segment 2, no alternative routes cross modeled Ute ladies'-tresses habitat, and, therefore, residual impacts are not anticipated (Table 4-112). However, both Alternative 2A: Proposed Action and Alternative 2B: Southern Route cross Ute ladies'-tresses AOI and are expected to result in disturbance in these areas. The types of potential effects and the application of mitigation measures to reduce impacts would be similar to the effects and application of mitigation measures described for Segment 1. Of the two alternative routes considered in Segment 2, Alternative 2B: Southern Route would result in greater amounts of disturbance to Ute ladies'-tresses AOI as it crosses approximately 20.0 more miles of AOI than Alternative 2A: Proposed Action (Table 3-113).

4.3.18.5.2.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

WYNDD modeled habitat for several BLM sensitive plant species is crossed by all alternative routes in Segment 3 (Table 3-113). The types of potential effects and the application of mitigation measures to reduce impacts on BLM sensitive plants would be similar to effects and application of mitigation measures described for Segment 1.

All alternative routes in Segment 3 cross Ute ladies'-tresses modeled habitat and AOI in the floodplain of the Sweetwater River (Table 3-113). Without mitigation, effects on Ute ladies'-tresses could include direct effects such as habitat loss or damage to individuals and indirect effects similar to those effects on AOI described for Segment 1. Potential effects on Ute ladies'-tresses are discussed in greater detail in Section 4.3.18.2. Based on the impact criteria used in this analysis (Table 4-108), residual impacts on Ute ladies'-tresses are anticipated to be low (Table 4-112). Preconstruction surveys, design features, and agency-required mitigation measures to avoid plants and prevent impacts during sensitive periods are expected to reduce Project impacts on Ute ladies'-tresses modeled habitat.

All three alternative routes in Segment 3 cross the floodplain of the Sweetwater River in a similar alignment and are expected to result in the same amount of residual impacts on Ute ladies'-tresses (Table 4-112). Alternative 3C: Lost Creek to Highway 20/26 is expected to result in the greatest disturbance to Ute ladies'-tresses AOI as a result of crossing approximately 30.0 more miles of AOI than the least impactful alternative route, Alternative 3B: Lost Creek to Lost Cabin (Table 3-113).

4.3.18.5.2.5 230-Kilovolt Transmission Line

The construction of a 230kV transmission line to the proposed Riley Ridge Sweetening Plant would cross modeled habitat for large-fruited bladderpod but would not cross modeled habitat for any other special status plant species, including Ute ladies'-tresses AOI. Residual impacts would only be expected where the 230kV transmission line would cross large-fruited bladderpod habitat; expected impacts would be low

as a result of design features of the Proposed Action and application of agency-required mitigation measures.

4.3.18.5.2.6 Mainline Valve Distribution Lines

The MLV distribution lines would be expected to result in temporary and permanent disturbance to sensitive species habitat crossed. Without knowing the final location of the distribution lines, the amount of disturbance by species and which species habitats would be crossed as a result of distribution line construction cannot be provided at this time.

Application of design features and agency-required mitigation measures to reduce impacts associated with construction of the distribution lines would be consistent with that described for the Proposed Action. In addition, where the distribution lines would cross sensitive species habitats, the MLV could instead be powered through an on-site solar power system, which would effectively limit the amount of expected disturbance.

4.3.18.5.3 Noxious Weeds and Invasive Plant Species

There are 26 noxious weed species listed by Sublette, Fremont, Lincoln, Sweetwater, and Natrona counties with the potential to occur in the study area (Table 3-114). Vegetation removal and soil disturbance during construction create the potential conditions for the establishment of invasive, non-native species.

Substantial increases in weed prevalence would not be anticipated; however, despite efforts to prevent the spread of noxious weeds, it is possible that pipeline construction, operation, and maintenance activities would result in the spread or introduction of noxious weed species along the right-of-way or that weed species would be transported to areas that were relatively weed-free. Implementation of design features of the Proposed Action and agency-required mitigation measures and Appendix L – Noxious Weed Management Plan of the POD (Appendix A) for the Project would minimize the spread of undesirable weed species.

4.3.18.5.3.1 No Action Alternative

Under the No Action Alternative, a right-of-way grant on BLM-administered lands would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.18.5.3.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Under all Segment 1 alternative routes, noxious weed surveys would be conducted to evaluate the presence and extent of noxious weed and invasive species populations within the Project area. Preventative management measures would be applied as warranted pursuant to Appendix L of the POD (Appendix A). These preventative measures would detail practices aimed to prevent the spread of noxious weeds, control infestations, and reclaim disturbed areas to vegetation communities that are resistant to noxious weed invasion.

4.3.18.5.3.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Under all Segment 2 alternative routes, noxious weed surveys would be conducted to evaluate the presence and extent of noxious weed and invasive species populations within the Project area. Preventative management measures would be applied as warranted pursuant to Appendix L of the POD (Appendix A). These preventative measures would detail practices aimed to prevent the spread of noxious

weeds, control infestations, and reclaim disturbed areas to vegetation communities that are resistant to noxious weed invasion.

4.3.18.5.3.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Under all Segment 3 alternative routes, noxious weed surveys would be conducted to evaluate the presence and extent of noxious weed and invasive species populations within the Project area. Preventative management measures would be applied as warranted pursuant to Appendix L of the POD (Appendix A). These preventative measures would detail practices aimed to prevent the spread of noxious weeds, control infestations, and reclaim disturbed areas to vegetation communities that are resistant to noxious weed invasion.

4.3.18.5.3.5 230-Kilovolt Transmission Line

Constructing a 230kV transmission line to the proposed Riley Ridge Sweetening Plant could result in effects on noxious weeds similar to the effects resulting from pipeline construction, operation, and maintenance activities described in Section 4.3.18.2. Ground-disturbing activities and an increased risk of seed transport could result in the establishment and spread of noxious and invasive weeds, but preventative management measures would be applied as warranted pursuant to Appendix L of the POD (Appendix A).

4.3.18.5.3.6 Mainline Valve Distribution Lines

The construction of the MLV distribution lines could potentially allow for the spread and establishment of noxious and invasive weeds through ground-disturbing activities and seed transport. Preventative management measures would be applied as warranted pursuant to Appendix L of the POD (Appendix A).

4.3.18.6 Summary Comparison of Alternative Routes

4.3.18.6.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

In Segment 1, all alternative routes would result in comparable disturbance to big sagebrush and shrub-steppe vegetation communities, which would result in moderate residual impacts. Design features of the Proposed Action aimed to limit noxious weed invasion is expected to reduce disturbance to these vegetation communities. None of the alternative routes in Segment 1 cross Ute ladies'-tresses modeled habitat and impacts on the species are not expected in Segment 1.

4.3.18.6.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

In Segment 2, both alternative routes would result in comparable disturbance to big sagebrush and shrub-steppe vegetation communities, which would result in moderate residual impacts. Project design features aimed to limit noxious weed invasion is expected to reduce disturbance to these vegetation communities. None of the alternative routes in Segment 2 cross Ute ladies'-tresses modeled habitat and impacts on the species are not expected in Segment 2.

4.3.18.6.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

In Segment 3, all alternative routes would result in comparable disturbance to big sagebrush and shrub-steppe vegetation communities, which would result in moderate residual impacts. Alternative 3A: Proposed Action would also result in disturbance to Limber Pine-Juniper vegetation communities where moderate residual impacts are anticipated. Design features of the Proposed Action aimed to limit noxious

weed invasion is expected to reduce disturbance to these vegetation communities. All alternative routes cross modeled Ute ladies'-tresses habitat in the floodplain of the Sweetwater River (on the same alignment) and would result in equal amounts of disturbance. Mitigation measures to reduce effects through avoidance and control of noxious weeds are expected to minimize residual impacts on Ute ladies'-tresses.

4.3.19 Visual Resources

4.3.19.1 Issues Identified for Analysis

The issues identified for analysis regarding visual resources include an assessment of potential impacts on scenery, potential impacts on views, potential effects on BLM VRI components (SQRUs only), and compliance with federal agency management objectives. Each of these elements is briefly described below:

- **Scenery**. Impacts on scenery (otherwise known as visual resources) focus on potential effects from the Project on the inherent scenic characteristics and qualities of the landscape as a whole, regardless of views from specific users. This analysis includes potential impacts from the construction, operation, and maintenance of the Project and includes disclosure of impacts near VRM Class I and II areas, as is specifically mentioned in the Scoping Report (BLM 2014c). Assessment of impacts on scenery near NHTs is also mentioned within the Scoping Report (BLM 2014c) and is specifically discussed in Section 4.3.7.
- **BLM VRI**. Although there are four basic components included within the BLM's VRI process, not all of these components relate directly to (or can be directly influenced by) a proposed project. The relevance of each VRI component to the Project is briefly described below:
  - **SQRU**. These units are made up of portions of the landscape that have similar visual characteristics and are rated as to their relative scenic value (A, B, and C—from highest to lowest in quality). Proposed projects can potentially affect the value of these units, or portions of these units. The Project's influence on SQRUs is hence included as part of this analysis.
  - **SLRU**. While SLRUs can be used to gain some basic and broad-scale understanding about variations in public sensitivities to visual changes, these sensitivities are non-Project specific and may or may not accurately or fully represent public sensitivities to this Project. It is also difficult to predict how a specific project might affect (increase or decrease) general public sensitivities within these units. SLRUs are examined in relation to SQRUs in this analysis to broadly explain potential sensitivities to changes within differing SQRUs, and specific public sensitivities to this Project have been gathered during the public scoping process and will be gathered through the public comment processes. For informational purposes, tables depicting the amount of SLRUs crossed by the Project are provided in Appendix D.
  - **VDZs**. Because VDZs are generally based on viewing platforms that are heavily used or specifically sensitive, it is unlikely that a specific project (other than perhaps a major highway or travelway) would introduce a new VDZ viewing platform or increase/decrease use of an existing VDZ viewing platform to the point that it should no longer be included in the VRI. Potential impacts on VDZs are therefore not included in this analysis. For informational purposes, tables depicting the amount of each VDZ crossed by the Project are provided in Appendix D.
  - **VRI Classes**. VRI classes are a culmination of overlaying the SQRUs, SLRUs, and VDZs. They are specifically created to inform BLM staff regarding relative importance of visual resources for RMPs or other planning or siting exercises. Impacts on VRI classes therefore

depend on impacts on or changes to each of the underlying components and are not directly applicable in evaluating specific projects. Impacts on VRI classes are therefore not addressed in this analysis. For informational purposes, tables depicting the amount of each VRI class crossed by the Project are provided in Appendix D.

- **Views**. The analysis of potential impacts on views focuses on locations from which the public could have views of the Project and whether these views could be adversely modified through the introduction of Project components into their viewshed. This analysis includes disclosure of potential impacts on views from recreational users and landowners, as specifically noted in the Scoping Report (BLM 2014c).
- **Compliance with Federal Agency Management Objectives**. The assessment of compliance is a determination of whether the modifications introduced by the Project would be consistent with the land-use planning process, including the BLM VRM process that is specifically mentioned in the Scoping Report (BLM 2014c). Topics associated with this Project include compliance with BLM VRM class objectives and compliance with BLM field office RMPs as required by the FLPMA.

4.3.19.2 Types of Potential Effects

The construction, operation, and maintenance of the Project would result in effects on visual resources where:

- the Project would introduce visible contrast to the existing landscape and its inherent character
- the Project would modify the viewer's experience
- the Project would be out of compliance with current BLM VRM class compliance objectives or field office RMPs

Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.19.3 Criteria for Assessing Impacts

This section focuses on the identification and characterization of impacts on visual resources resulting from the construction, operation, and maintenance of the Project. Table 4-113 provides criteria for assessing the level of impacts. These criteria are consistent with BLM Manual 8400-Visual Resource Management and assist in classifying the levels of impact on scenery and views into categories of high, moderate, or low.

Table 4-113 Criteria for Assessing Level of Impacts on Visual Resources	
Level of Impacts	**Description**
High	▪ Scenery. Modification of high quality, diverse, and rare or unique scenery (Class A or B) results in a high level of change (contrast) to their character.
	▪ Views. Contrast produced by the Project would demand attention and dominate views from viewing locations where form, line, color, and texture of Project components would be incongruent with existing landscape features.
Moderate	▪ Scenery. The inherent quality of interesting, but not outstanding, landscapes (Class B or C) would be modified without substantially altering their character.
	▪ Views. Contrast produced by the Project would attract attention from viewing locations and would be co-dominant with existing landscape features.
Low	▪ Scenery. There would be minimal change to the existing character of interesting and common landscapes (Class B or C).
	▪ Views. Contrast produced by the Project would be subordinate to existing landscape features and would not be readily apparent from viewing locations.

4.3.19.4 Mitigation Planning

Initial impacts are those effects resulting from the implementation of the Project, including implementation of design features of the Proposed Action for environmental protection (Table 2-18). Initial impacts were assigned using the criteria for assessing impacts (Table 4-113). The specific design features of the Proposed Action relevant to visual resources include:

- **Design Feature 18 (visual resources).** Applied during construction to reduce visual impacts by delineating construction boundaries and minimizing areas of ground disturbance; preserving vegetation to the greatest extent possible; stripping, salvaging and replacing topsoil; contoured grading; controlling erosion; using dust suppression techniques as required; and restoring exposed soils and landforms as closely as possible to their original contour and vegetation.

Throughout the Project, design features were applied to reduce initial impact levels. To further reduce impacts in more sensitive sections of the Project and assist with government agency compliance objectives, 10 agency-required mitigation measures were developed. To decrease the level of impact on key areas, these mitigations were applied in sections of the Project where potential high and moderate initial impacts were identified. Agency-required mitigation measures were also applied to areas where the analysis identified noncompliance with federal agency management plans (i.e., compliance issues with BLM VRM Class II objectives). These agency-required mitigation measures include:

- **Agency-Required Mitigation Measure 1 (sensitive resource avoidance).** Applied where the Project could directly impact scenic values, this would be done to avoid placement of above-ground facilities in visually sensitive areas, and micro-siting of the alignment to reduce visual contrast introduced by the Project.
- **Agency-Required Mitigation Measure 2 (minimize construction on greater slopes).** Applied in areas where the construction of access roads would require switchbacks and additional areas to be graded. This mitigation measure would reduce contrast created by new access roads through the reduction of earthwork in sloped areas where grading could expose underlying soils, which would increase color, form, and texture contrast.
- **Agency-Required Mitigation Measure 3 (minimizing or avoiding disturbance to sensitive soils and vegetation).** Applied where existing access would potentially need to be widened or upgraded for construction and maintenance. It would reduce visual contrast, particularly modifications to the existing landscape's line and color elements, by reducing the widening and

additional clearing of adjacent vegetation for access, as well as minimizing the area of disturbance in characteristic vegetation communities.

- **Agency-Required Mitigation Measure 4 (blend road cuts and grading).** Applied where grading in steep rocky areas creates strong visual contrast in the landscape. Blending and/or coloring areas of cut and fill would reduce contrast between the exposed ground and the surrounding environment.
- **Agency-Required Mitigation Measure 5 (overland access).** Applied where the Project would generate additional long-term visual contrast through the removal of slow-to-regenerate vegetation communities as part of the construction of access roads. The construction contractor would use overland access, such as drive-and-crush, driving over vegetation where the vehicles would access the site, rather than blading and grading, thus modifying the landscape less significantly.
- **Agency-Required Mitigation Measure 6 (minimizing tree clearing**). Applied where the Project crosses overstory vegetation (i.e., pinyon-juniper or riparian corridors). It would reduce impacts by decreasing visual contrast created by the removal of overstory vegetation (trees) and the hard visual line created by the cleared right-of-way/forest interface. In addition to reducing visual contrast, this agency-required mitigation measure would minimize disturbance to characteristic vegetation communities.
- **Agency-Required Mitigation Measure 8 (interim or intense reclamation).** Applied where the Project would generate long-term visual contrast through the removal of slow-to-regenerate vegetation communities and where this contrast would be inconsistent with designated VRM Class objectives. Through the application of more intensive reclamation techniques, the visual contrast introduced by the Project would be diminished and begin to blend with the existing landscape's form, line, color, and texture.
- **Agency-Required Mitigation Measure 9 (minimize new or improved accessibility).** Applied where access roads needed for construction, but not for maintenance, would be rehabilitated. It would reduce the modification of the line and color elements of visual contrast, in particular, where road construction would occur in slow-to-regenerate vegetation communities.

4.3.19.5 Results (Direct and Indirect Residual Effects)

The assessment of impacts on visual resources began with a baseline analysis of the degree of contrast expected by the Project components. This analysis included an assessment of both structure contrast and landscape contrast. While structure contrast was based on expected degrees of contrast between proposed above-ground facilities and their relationship to existing built features, landscape contrast was based on expected degrees of change to the landforms and vegetation. This analysis is conducted using GIS modeling and results in expected degrees of overall Project-related contrast. These degrees of Project contrast are incorporated into the impacts on scenery and views, which are discussed in the subsequent sections of this EIS.

Inventory and impact results for this section are displayed on MV-11. The impact levels represented on MV-11 are a composite of both scenery impacts and viewer impacts.

4.3.19.5.1 Scenery

The effects of the proposed pipeline alignments on the landscape scenery would include the appearance of a defined band of vegetative clearing and ground disturbance stretching across the generally flat to gently rolling landscapes. The vegetative clearings and ground disturbance within the Project right-of-way would result in hard edges through relatively dense sagebrush steppe vegetation. The construction of access roads would also create linear clearings and ground disturbance, including defined edges through

the existing vegetation. Proposed above-ground facilities, on the other hand, would potentially affect scenery by introducing occasional clusters of geometric lines and forms into the landscape—in addition to distinct edges associated with vegetative clearing.

To correlate the overall degree of Project contrast with scenery impacts, the varying levels of Project contrast were compared to the scenic quality ratings of A, B, and C. This correlation results in high, moderate, and low degrees of impact on scenery from the Project. The results of this analysis are presented in Table 4-114, which provides a comparison of miles of residual impacts on scenery by alternative, as well as per route and per segment.

Table 4-114
Residual Impacts on Scenery

Alternative	Total Miles	Residual Impacts (miles)		
		High	Moderate	Low
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant				
1A: Proposed Action	30.4	0.0	4.0	26.4
1A Variation: Dry Basin Draw	30.7	0.0	4.0	26.7
1B: Dry Piney	34.5	0.0	4.0	30.5
1C: Figure Four	38.5	0.0	2.6	35.9
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect				
2A: Proposed Action	129.1	0.0	67.0	62.1
2B: Southern Route	136.2	0.0	48.4	87.8
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect				
3A: Proposed Action	83.2	0.0	0.3	82.9
3B: Lost Creek to Lost Cabin	73.0	0.0	0.1	72.9
3C: Lost Creek to Highway 20/26	101.4	0.0	0.1	101.3

For each alternative, SQRUs and SLRUs are examined in relation to one another. Although the public sensitivity data associated with SLRUs are not specifically related to the Project, they do provide baseline data regarding a general degree of sensitivity to visual changes. Comparing the relationships between SQRUs and SLRUs provides a broad scale of potential scenery impact levels that can be compared between alternative routes by segment. This approach results in a variety of scenery impact levels—from high sensitivity Class A landscapes at the high end of the spectrum to low sensitivity Class C landscapes at the low end of the spectrum.

Another component included in the assessment of impacts on scenery is the visual influence of the Project on each SQRU. This analysis, included below in tabular format for each alternative by segment, provides a comparison of the amount of each BLM SQRU that falls within the 3-mile influence zone of the Project. Because this component of the assessment is focused on the impacts on each BLM SQRU as a whole, the total area included for each SQRU represents the entire area of that SQRU, regardless of extents of the study corridor boundary.

While most of the scenery within the Project area has a landscape character that is typical of the Wyoming Basin, there are particular landscapes that contain a more distinctive landscape character. Because distinctive landscapes are valued more from a visual resource perspective, impacts on the more distinctive landscapes (such as the Green River) are specifically described in further detail by Project segment.

4.3.19.5.1.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed, and the environment would remain as it presently exists.

4.3.19.5.1.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Project impacts on scenery in Segment 1 are similar to the impacts described in the introduction above, under Section 4.3.19.5. The linear geometric shapes that would be introduced by the Project would affect Class A scenery with a high sensitivity, Class B scenery with a moderate sensitivity, and Class C scenery with moderate sensitivity lands along the Proposed Action. Similar geometric shapes would be introduced thus affecting other route variations and alternative routes in the same manner. Miles crossed of each SQRU class in association with SLRU levels are provided in Table 4-115, and the visual influence of the Project on each SQRU is described in Table 4-116.

It is important to note that additional miles of Class B scenery with a moderate sensitivity are crossed by Alternatives 1B: Dry Piney and 1C: Figure Four. These crossings are associated with upland landscapes that have already been modified by oil and gas operations, whereas other portions of this mileage on all alternative routes include crossing the Green River and its riparian corridor in an area with a lesser degree of cultural modifications.

Table 4-115
Scenic Quality Level Rating Units in Association with Sensitivity Level Rating Units Crossed in Segment 1

Alternative Route	Total Miles	Class A	Class B			Class C		
		High	High	Moderate	Low	High	Moderate	Low
1A: Proposed Action	30.4	2.5	0.0	2.3	0.0	0.0	7.7	17.9
1A Variation: Dry Basin Draw	30.7	2.5	0.0	2.3	0.0	0.0	7.7	18.2
1B: Dry Piney	34.5	2.5	0.0	10.3	0.0	0.0	7.7	14.0
1C: Figure Four	38.5	2.5	0.0	7.7	0.0	0.0	9.5	18.8

Table 4-116
Extent of Bureau of Land Management
Scenic Quality Rating Units Influenced by the Project in Segment 1

Name	Class	Area (acres)	Alternative 1A: Proposed Action		Alternative 1A Variation: Dry Basin Draw		Alternative 1B: Dry Piney		Alternative 1C: Figure Four	
			Area Influenced by the Project (acres)	Percentage of SQRUs Influenced by the Project	Area influenced by the Project (acres)	Percentage of SQRUs Influenced by the Project	Area Influenced by the Project (acres)	Percentage of SQRUs Influenced by the Project	Area Influenced by the Project (acres)	Percentage of SQRUs Influenced by the Project
Pinedale Field Office										
Wyoming Foothills	A	151,414	14,428	9.5	14,428	9.5	14,428	9.5	14,428	9.5
Big Mesa	B	39,222	8,027	20.5	9,183	23.4	9,183	23.4	28,153	71.8

Table 4-116
Extent of Bureau of Land Management
Scenic Quality Rating Units Influenced by the Project in Segment 1

Name	Class	Area (acres)	Alternative 1A: Proposed Action		Alternative 1A Variation: Dry Basin Draw		Alternative 1B: Dry Piney		Alternative 1C: Figure Four	
			Area Influenced by the Project (acres)	Percentage of SQRUs Influenced by the Project	Area influenced by the Project (acres)	Percentage of SQRUs Influenced by the Project	Area Influenced by the Project (acres)	Percentage of SQRUs Influenced by the Project	Area Influenced by the Project (acres)	Percentage of SQRUs Influenced by the Project
Deer Hills	B	30,303	1,582	5.2	1,582	5.2	1,582	5.2	1,582	5.2
Lower Green River	B	23,135	6,552	28.3	6,552	28.3	6,552	28.3	4,477	19.4
Lower Green River Cliffs	B	3,661	1,451	39.6	1,451	39.6	1,451	39.6	–	–
Milleson Draw	B	55,537	2,331	4.2	2,331	4.2	2,331	4.2	296	0.5
Piney Creek	B	72,371	13,697	18.9	13,697	18.9	13,697	18.9	13,697	18.9
N. La Barge	C	99,366	43,735	44.0	43,735	44.0	43,695	44.0	49,192	49.5
SE Desert	C	218,561	2,814	1.3	2,814	1.3	2,814	1.3	2,814	1.3
Little Colorado Desert	C	285,178	27,003	9.5	27,003	9.5	14,428	9.5	–	–
Sublette Flats	C	500,759	5,329	1.1	5,329	1.1	9,183	23.4	–	–
Rock Springs Field Office										
LaBarge Spur	A	22,463	–	–	–	–	–	–	3,898	17.4
Little Colorado Desert	C	285,178	27,003	9.5	27,003	9.5	27,003	9.5	33,033	11.6
Sublette Flats	C	500,759	5,329	1.1	5,329	1.1	5,329	1.1	5,329	1.1

NOTE: The cells that have an en-dash (–) indicate the unit is not influenced by that alternative route.

4.3.19.5.1.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

The scenery throughout this segment would be affected by the construction, operation, and maintenance of the Project. The clearing would create a straight edge against the existing vegetation in mostly Class C landscapes; however, Class B scenery with high sensitivity and Class B scenery with moderate sensitivity would also be affected. Miles crossed of each SQRU class in association with SLRU levels are shown in Table 4-117, and the visual influence of the Project on each SQRU is described in Table 4-118.

Table 4-117
Scenic Quality Level Rating Units in Association with Sensitivity Level Rating Units Crossed in Segment 2

Alternative Route	Total Miles	Class A	Class B			Class C		
		High	High	Moderate	Low	High	Moderate	Low
2A: Proposed Action	129.1	0.0	28.1	12.0	0.0	44.1	44.9	0.0
2B: Southern Route	136.2	0.0	15.7	15.3	0.0	57.9	47.3	0.0

Table 4-118
Extent of Bureau of Land Management
Scenic Quality Rating Units Influenced by the Project in Segment 2

Name	Class	Area (acres)	Alternative 2A: Proposed Action		Alternative 2B: Southern Route	
			Area Influenced by the Project (acres)	Percentage of SQRUs Influenced by the Project	Area Influenced by the Project (acres)	Percentage of SQRUs Influenced by the Project
Lander Field Office						
Antelope Hills	B	332,334	58,456	17.6	58,456	17.6
Crooks Mountain	B	84,703	12,013	14.2	12,013	14.2
Green Mountain	B	107,948	4,143	3.8	4,143	3.8
Crooks Gap	C	20,617	13,875	67.3	13,875	67.3
Pinedale Field Office						
Milleson Draw	B	55,537	358	0.6	358	0.6
SE Desert	C	218,561	23,414	10.7	4,167	1.9
Rawlins Field Office						
LaBarge Spur	A	22,463	3,898	17.4	–	–
Luman Butte	C	32,439	197	0.6	197	0.6
Stratton Draw	C	424,314	45,121	10.6	45,121	10.6
Little Colorado Desert	C	285,178	33,033	11.6	–	–
Sublette Flats	C	500,759	5,329	1.1	–	–
Rock Springs Field Office						
Steamboat Mountain	A	47,051	1,693	3.6	5,274	11.2
Luecite Hills	B	27,093	–	–	6,345	23.4
Sand Dunes	B	79,940	–	–	39,151	49.0
Tenmile Draw	B	332,702	–	–	9,601	2.9
The Pinnacles	B	20,745	–	–	1,293	6.2
White Mountain	B	282,122	–	–	22,474	8.0
Big Sandy Recreation Area	B	30,665	7,387	24.1	–	–
Jack Morrow Hills	B	147,915	79,397	53.7	–	–
The Pinnacles	B	20,745	11,560	55.7	–	–
Continental Divide	C	331,329	–	–	16,425	5.0
Dry Sandy Hills	C	236,833	39,778	16.8	–	–
Great Divide Basin	C	260,860	94,015	36.0	99,847	38.3
Green River Plains	C	–	–	–	342	0.1
Little Colorado Desert	C	285,178	10,772	3.8	99,249	34.8
Rock Springs Valley	C	–	–	–	19,886	20.9
Sublette Flats	C	500,759	101,675	20.3	78,303	15.6

NOTE: The cells that have an en-dash (–) indicate the unit is not influenced by that alternative route.

4.3.19.5.1.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Project impacts on scenery would be typical throughout the landscapes found in the Wyoming Basin Province, as described in the description under Section 4.3.19.5. Both Class B scenery with high sensitivity and Class B scenery with moderate sensitivity would be affected by all three alternative routes.

Miles crossed of each SQRU in association with SLRUs are shown in Table 4-119, and the visual influence of the Project on each SQRU is described in Table 4-120.

Table 4-119
Scenic Quality Level Rating Units in Association with Sensitivity Level Rating Units Crossed in Segment 3

Alternative Route	Total Miles	Class A	Class B			Class C		
		High	High	Moderate	Low	High	Moderate	Low
3A: Proposed Action	83.2	0.0	11.1	11.7	1.7	18.6	19.1	21.0
3B: Lost Creek to Lost Cabin	73.0	0.0	6.8	6.5	0.0	13.2	0.2	46.3
3C: Lost Creek to Highway 20/26	101.4	0.0	6.8	6.5	0.0	23.1	15.0	50.0

Table 4-120
Extent of Bureau of Land Management
Scenic Quality Rating Units Influenced by the Project in Segment 3

Name	Class	Area (acres)	Alternative 3A: Proposed Action		Alternative 3B: Lost Creek to Lost Cabin		Alternative 3C: Lost Creek to Highway 20/26	
			Area Influenced by the Project (acres)	Percentage of SQRUs Influenced by the Project	Area Influenced by the Project (acres)	Percentage of SQRUs Influenced by the Project	Area Influenced by the Project (acres)	Percentage of SQRUs Influenced by the Project
Casper Field Office								
Coalbank Hills	B	49,165	26,509	53.9	–	–	–	–
Powder River Breaks	B	316,925	4,917	1.6	–	–	8,831	2.8
Rattlesnakes	B	66,579	13,736	20.6	–	–		
Pine Mountain	C	73,854	9,550	12.9	–	–	23,073	31.2
Western Natrona	C	575,425	90,455	15.7	–	–	91,170	15.8
Land Field Office								
Agate Flats	B	266,475	23,225	8.7	23,225	8.7	23,225	8.7
Beaver Rim	B	79,414	4,280	5.4	4,280	5.4	4,280	5.4
Crooks Mountain	B	84,703	10,496	12.4	10,496	12.4	10,496	12.4
Granite Mountains	B	74,729	20,929	28.0	20,929	28.0	20,929	28.0
Green Mountain	B	107,948	7,761	7.2	7,761	7.2	7,761	7.2
Lysite Mountains	B	78,075	–	–	1,126	1.4	–	–
Sweetwater Valley	B	59,412	3,898	6.6	3,898	6.6	3,898	6.6
Badwater	C	186,652	–	–	52,494	28.1	23,850	12.8
Crooks Gap	C	20,617	16,096	78.1	16,096	78.1	16,096	78.1
Gas Hills	C	47,882	35,662	74.5	24,370	50.9	24,370	50.9
Moneta	C	244,276	24,337	10.0	78,791	32.3	93,418	38.2
Signor Ridge	C	197,884	16,146	8.2	25,502	12.9	25,502	12.9
Sweetwater Plains	C	195,580	23,481	12.0	23,481	12.0	23,481	12.0

NOTE: The cells that have an en-dash (–) indicate the unit is not influenced by that alternative route.

4.3.19.5.1.5 230-Kilovolt Transmission Line

The impacts on scenery resulting from the 1-mile-long 230kV transmission line would include the introduction of repetitive vertical geometric forms (transmission line structures) as well as a geometric clearing from right-of-way vegetation clearing and the construction of access roads in Class C scenery with a moderate inventoried visual sensitivity. No high visually sensitive landscapes would be affected by the introduction of the proposed 230kV transmission line.

4.3.19.5.1.6 Mainline Valve Distribution Lines

Distribution lines would be constructed as part of the Project to serve MLV. These 35' mono-pole structures would introduce a repetitive wooden vertical element at approximately every 250' along with a temporary geometric clearing at the base of each mono-pole contrasting with the existing landscape's vegetative patterns. In addition, the distribution lines would introduce linear vegetation clearings formed by the right-of-way and the created access roads. The landscapes affected would be similar to those crossed by the specific alternative through each respective segment.

4.3.19.5.2 BLM Visual Resource Inventory

As described previously, the BLM VRI consists of four components: (1) SQRUs, (2) SLRUs, (3) VDZs, and (4) VRI Classes. While the visual influence that the Project would have on each SQRU is included in the "Scenery" section of Section 4.3.19.5, the miles of the Project occupying each level or class within this inventory are provided by alternative route and field office in Appendix D.

4.3.19.5.3 Views

Project components would appear within the viewshed of a variety of viewing locations, identified as KOPs, including travel routes and recreation sites (KOP locations are shown on MV-11). To correlate the overall degree of Project contrast with the viewing locations, the levels of Project contrast were compared with Project-level distance zone offsets from each viewing location. These Project-level VDZs represent decreasing degrees of visual influence that the Project would have on views as the distance from the viewing locations increases. Five influence zones were used for this analysis: 0 to 0.5 mile; 0.5 mile to 1.0 mile; 1.0 to 2.0 miles; 2.0 to 3.0 miles; and 3.0 miles and greater. The results of this analysis are included in Table 4-121, which provides the miles of residual impacts on viewing locations by alternative route. These results account for portions of the Project that would not be visible from the viewing locations.

In addition, the number of miles of each distance zone crossed by the Project is provided in tabular form for each alternative by segment. These tables allow for easy comparison of which alternative routes have more or less overall proximity to viewing locations. Brief narratives have also been provided for each KOP as they relate to the alternative routes by segment. All KOP worksheets completed from the KOP locations are included in Appendix D, including those associated with NSTs and NHTs. Impact discussions regarding the KOPs for NSTs and NHTs are included in Section 4.2.7.

Table 4-121
Residual Impacts on Viewers

Alternative Route	Total Miles	Residual Impacts (miles)		
		High	Moderate	Low
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant				
1A: Proposed Action	30.4	0.0	2.8	27.6
1A Variation: Dry Basin Draw	30.7	0.0	2.8	27.9
1B: Dry Piney	34.5	0.0	2.8	31.7
1C: Figure Four	38.5	0.0	1.4	37.1

Table 4-121 Residual Impacts on Viewers				
Alternative Route	**Total Miles**	**Residual Impacts (miles)**		
		High	**Moderate**	**Low**
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect				
2A: Proposed Action	129.1	0.0	44.5	84.6
2B: Southern Route	136.2	0.0	5.1	131.1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect				
3A: Proposed Action	83.2	0.0	1.7	81.5
3B: Lost Creek to Lost Cabin	73.0	0.0	2.0	71.0
3C: Lost Creek to Highway 20/26	101.4	0.0	41.7	59.7

4.3.19.5.3.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.19.5.3.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Table 4-122 describes the miles of the Project in each Project-level distance zone run from the viewing locations or KOPs introduced in Chapter 3. Descriptions of impacts from each KOP are described below.

- KOP P-2 Green River Recreational Corridor: Users of the Green River, including the North and South Long Island Green River walk-in fishing access sites, would see a linear clearing of vegetation where the right-of-way associated with Alternative 1A: Proposed Action would cross this area. To reduce the contrast introduced by this vegetation clearing, the agency-required mitigation measure to bore the Project under the Green River and adjacent vegetation (i.e., cottonwood trees) to maintain the band of vegetation adjacent to the Green River would be applied. Through the application of Agency-Required Mitigation Measures 1, 3, 5, 6, 8, and 9, the visual contrast introduced by the Project would be further reduced. Effects on views from the Green River would be similar for the other alternative routes, with the exception of Alternative 1C: Figure Four. This alternative crosses the river into an area of agriculture on the east side of the river, which (based on the type of vegetation present) would revegetate sooner than the natural lands present at the other river crossing. Refer to Appendix D for the associated visual simulation and KOP worksheet.

Table 4-122 Visual Distance Zones in Segment 1						
Alternative Route	**Total Miles**	**Project-Level Distance Zone from Viewers (miles)**				
		0 to 0.5 mile	**0.5 to 1 mile**	**1 to 2 miles**	**2 to 3 miles**	**3 plus miles**
1A: Proposed Action	30.4	1.5	2.2	2.3	2.3	22.1
1A Variation: Dry Basin Draw	30.7	1.5	2.2	2.3	2.3	22.4
1B: Dry Piney	34.5	1.5	2.2	2.3	2.2	26.3
1C: Figure Four	38.5	1.3	2.6	2.6	2.7	29.3

4.3.19.5.3.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Table 4-123 describes the miles of the Project in each Project-level distance zone run from the viewing locations or KOPs introduced in Chapter 3. Descriptions of impacts from each KOP are described below.

- KOP RS-1 Red Desert Backcountry Byway: The introduction of a cleared right-of-way, associated with Alternative 2A: Proposed Action, located directly adjacent to the road, would generate long-duration impacts on views from this location. The construction, operation, and maintenance of the Project will appear as a wide band parallel to the travel route altering the line, color, and texture of the existing vegetation. The right-of-way clearing would create a linear path creating a hard edge against existing vegetation and the excavation would change the landform's color and texture. Through application of Agency-Required Mitigation Measures 1, 2, 3, 4, 5, 8, and 9, the visual contrast introduced by the Project would be reduced. Refer to Appendix D for the associated visual simulation and KOP worksheet (Note: visual simulation does not include the application of agency-required mitigation measures). Views from the Red Desert Backcountry Byway would not be affected by Alternative 2B: Southern Route.
- KOP RS-2 U.S. Highway 191: Impacts on views from this location associated with Alternative 2A: Proposed Action would be short in duration due to topographic screening. The excavation of the right-of-way would create a horizontal butt edge against the vegetation. Viewers would see the linear clearing of vegetation following existing terrain but modifying the existing landscape's color and texture. Through application of Agency-Required Mitigation Measures 3 and 5, visual contrast introduced by the Project would be reduced. Impacts on views associated with Alternative 2B: Southern Route would be similar. Refer to Appendix D for the associated KOP worksheet.
- KOP RS-3 Boars Tusk: Views from the Boars Tusk would not be affected by Alternative 2A: Proposed Action. Since Alternative 2B: Southern Route is located adjacent to the Boars Tusk, the Project would cross views at this unique rock formation and recreation landmark. The views from the Boars Tusk are slightly elevated looking over a panoramic landscape. The geometrically cleared vegetation band created by the right-of-way across the landscape would be inconsistent with the existing character. Due to the presence of existing linear facilities, the modification of the existing landscape's vegetative forms, lines, colors, and textures would begin to attract attention but would not dominate the views. Through the application of Agency-Required Mitigation Measures 1, 3, 5, 8, and 9, the visual contrast introduced by the Project would be reduced. Refer to Appendix D for the associated visual simulation and KOP worksheet (Note: visual simulation does not include the application of agency-required mitigation measures).

Table 4-123
Visual Distance Zones in Segment 2

Alternative Route	Total Miles	Project-Level Distance Zone from Viewers (miles)				
		0 to 0.5 mile	0.5 to 1 mile	1 to 2 miles	2 to 3 miles	3 plus miles
2A: Proposed Action	129.1	42.5	2.2	4.9	4.5	75.0
2B: Southern Route	136.2	3.1	3.0	6.3	6.8	117.0

4.3.19.5.3.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Table 4-124 describes the miles of the Project in each Project-level distance zone run from the viewing locations or KOPs introduced in Chapter 3. Descriptions of impacts from each KOP are described below.

- KOP L-1 U.S. Highway 287: Impacts on views from U.S. Highway 287 associated with the implementation of Alternative 3A: Proposed Action would be the introduction of an additional linear utility in this viewshed. Due to the nearly level terrain in the area, the geometrically cleared right-of-way would not be readily apparent except at the crossing of the highway. Effects on views from U.S. Highway 287 would be the same for all alternative routes since the alternative routes share a common alignment in this area. Refer to Appendix D for the associated visual simulation and KOP worksheet.
- KOP C-1 U.S. Highway 20: Impacts on views from U.S. Highway 20 resulting from the implementation of Alternative 3A: Proposed Action would be minimal due to the perpendicular crossing of the highway, resulting in a short duration view of the Project in an area modified by other pipeline corridors and their geometrically cleared rights-of-way. Impacts on U.S. Highway 20 would be similar for Alternative 3B: Lost Creek to Lost Cabin. Impacts on U.S. Highway 20 resulting from Alternative 3C: Lost Creek to Highway 20/26 would be longer in duration as the Project parallels the road for approximately 40 miles. The vegetation in this area is primarily grasslands with a short revegetation period, which would, over time, reduce the contrast introduced by the Project and would eventually appear similar to the existing pipelines in the area. Refer to Appendix D for the associated KOP worksheet.

Table 4-124
Visual Distance Zones in Segment 3

Alternative Route	Total Miles	Project-level Distance Zone from Viewers (miles)				
		0 to 0.5 mile	0.5 to 1 mile	1 to 2 miles	2 to 3 miles	3 plus miles
3A: Proposed Action	83.2	1.2	2.4	3.2	3.2	73.2
3B: Lost Creek to Lost Cabin	73.0	2.0	3.0	4.2	4.4	59.4
3C: Lost Creek to Highway 20/26	101.4	41.8	2.5	3.2	3.3	50.6

4.3.19.5.3.5 230-Kilovolt Transmission Line

The 230kV transmission line providing power to the proposed Riley Ridge Sweetening Plant would be located approximately 7.5 miles away from the nearest KOP, KOP P-2 Green River Recreational Corridor. Due to the distance from the KOP and the topographic elements in between the viewers and the proposed transmission line, views would not be affected.

Mainline Valve Distribution Lines

The introduction of the distribution lines to views would result in different levels of contrast depending on the views being affected. The scale of the power line is similar to the scale of power lines present in other portions of the study area providing power to oil and gas wells, ranches, and other facilities requiring power; however, agency-required mitigation measures throughout the Project would be considered on a site-specific basis. These MLV distribution lines could potentially be buried or could use solar power in areas without immediate access to a power drop and in areas that are visually sensitive (i.e., in proximity to scenic roads and recreation areas).

4.3.19.5.4 Compliance with Federal Agency Visual Management Objectives

BLM VRM objectives would be met where the Project would cross BLM VRM Class III and IV lands. In locations where the Project would cross BLM VRM Class II areas; however, compliance with VRM Class II objectives would need to be further analyzed at three particular locations: KOP P-2 Green River Recreational Corridor, KOP RS-1 Red Desert Backcountry Byway, and KOP RS-3 Boars Tusk. Based on the KOP contrast rating analysis conducted, the Project would not meet BLM VRM Class II objectives with initial Project design. However, agency-required mitigation measures, including intense interim and final reclamation and other agency-required mitigation measures, would be applied to reduce the level of contrast introduced by the Project. With application of these agency-required mitigation measures, the Project would meet VRM Class objectives along all alternative routes, as described in Table 4-125.

Regarding the three KOPs analyzing VRM Class II lands, the following descriptions provide a summary of the analysis contained in the KOP worksheets. For more detail regarding these KOPs and the KOPs analyzing VRM Class III and IV lands, the BLM contrast rating worksheets are included in Appendix D. (Note: Impacts on views specifically from the KOPs, regardless of VRM Class crossed, are described in the previous viewing location impact discussions.)

- KOP P-2 Green River Recreational Corridor: The Project, on Alternatives 1A: Proposed Action, 1A Variation: Dry Basin Draw, 1B: Dry Piney, and 1C: Figure Four, would moderately to strongly contrast with the existing landscape character as viewed from the Green River and adjacent VRM Class II lands. This contrast would most be most intense where the Project would require clearing of riparian vegetation adjacent to the river, including cottonwoods, introducing geometric forms into a largely natural setting. (Note: Alternative 1C: Figure Four crosses the river in a more agricultural landscape setting compared to the other alternative alignment.) To bring the Project into compliance with VRM Class II objectives, Agency-Required Mitigation Measures 1, 3, 5, 6, 8, and 9 would be applied in this area. Of these mitigation measures, Agency-Required Mitigation Measure 1 (sensitive resource avoidance) would require the Project to be bored under the river and adjacent riparian vegetation to avoid generating a geometrically cleared right-of-way, and Agency-Required Mitigation Measure 8 (interim and intense reclamation) would further reduce contrast introduced by earthwork and access road construction, in particular on the cliffs adjacent to the Green River. Additionally, Agency-Required Mitigation Measure 8 includes additional reclamation strategies to reduce contrast in vegetation communities beyond the portion of the Project bored under the river. Refer to Appendix D for the associated visual simulation.
- KOP RS-1 Red Desert Backcountry Byway: Alternative 2A: Proposed Action of the Project would generate moderate to strong contrast with the existing landscape character on views from the Red Desert Scenic Backcountry Byway. Contrast would be most intense where superior views of the landscape would include the Project's geometrically cleared right-of-way. The Project parallels the scenic road in and adjacent to VRM Class II lands for approximately 20 miles. To bring the Project into compliance with VRM Class II objectives, especially in areas where views of the Project are superior, Agency-Required Mitigation Measures 1, 2, 3, 4, 5, 8, and 9 would be applied. Of these mitigation measures, Agency-Required Mitigation Measure 8 (interim and intense reclamation) would be most effective in reducing contrast, as it would require the application of vegetation treatments to blend the hard edge between the right-of-way and adjacent vegetation forms. The successful application of these mitigation measures would be essential to meet these visual management objectives in a largely natural setting, especially due to revegetating the right-of-way with slow-growing sagebrush and desert scrub vegetation. Refer to Appendix D for the associated visual simulation (Note: Visual simulation does not include the application of agency-required mitigation measures).

- KOP RS-3 Boars Tusk: Alternative 2B: Southern Route of the Project would generate moderate to strong contrast with the existing landscape character, as viewed from the Boars Tusk. Due to the superior view of the landscape from this site, the Project's geometrically cleared right-of-way would contrast with the existing vegetation patterns in this panoramic landscape. To bring the Project into compliance with VRM Class II objectives, Agency-Required Mitigation Measures 1, 3, 5, 8, and 9 would be applied. Of these mitigation measures, Agency-Required Mitigation Measure 8 (interim and intense reclamation) would be most effective in reducing contrast, as it would require the application of vegetation treatments to blend the hard edge between the right-of-way and adjacent vegetation forms. The successful application of these mitigation measures would be essential to meet these visual management objectives in a largely natural setting (Note: An existing 230kV transmission line is visible approximately 1.5 miles away to the southeast), especially due to revegetating the right-of-way with slow-growing sagebrush and desert scrub vegetation. Refer to Appendix D for the associated visual simulation (Note: Visual simulation does not include the application of agency-required mitigation measures).

Table 4-125
Compliance with Visual Management Objectives

Alternative Route	Total Miles	Compliance (in Miles)	
		Noncompliant	Compliant
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant			
1A: Proposed Action	30.4	0.0	30.4
1A Variation: Dry Basin Draw	30.7	0.0	30.7
1B: Dry Piney	34.5	0.0	34.5
1C: Figure Four	38.5	0.0	38.5
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect			
2A: Proposed Action	129.1	0.0	129.1
2B: Southern Route	136.2	0.0	136.2
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect			
3A: Proposed Action	83.2	0.0	83.2
3B: Lost Creek to Lost Cabin	73.0	0.0	73.0
3C: Lost Creek to Highway 20/26	101.4	0.0	101.4

4.3.19.5.4.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction

The Riley Ridge Sweetening Plant would be a new structure built in an undisturbed landscape, which will consist of three towers that would be approximately 200 feet in height. This facility would be located within landscape that is designated VRM Class IV. As such, this facility would meet the objectives of the Class IV designation.

Some nighttime lighting would be required for operational safety and security at the Riley Ridge Sweetening Plant. However, because of other minimal manmade sources of light in these remote areas, when viewed from nearby offsite locations, the overall change in ambient lighting conditions at the proposed plant site may be moderate to substantial.

Injection Wells

The injection wells would be located within landscape that is designated VRM Class IV. As such, these facilities would meet the objectives of the Class IV designation.

Segment 1 Pipeline Alternative Routes

Miles of the Project in VRM Management Class, by field office and alternative, are described in Table 4-126.

Table 4-126
Visual Resource Management Classes Miles Crossed by Field Office in Segment 1

Alternative Route	Total Miles	Pinedale Field Office			Rock Springs Field Office		Unclassified
		Class II	Class III	Class IV	Class III	Class IV	
1A: Proposed Action	30.4	3.2	3.7	11.8	0.0	6.5	5.2
1A Variation: Dry Basin Draw	30.7	3.2	3.7	12.1	0.0	6.5	5.2
1B: Dry Piney	34.5	3.2	6.2	8.0	0.0	6.5	10.6
1C: Figure Four	38.5	2.3	8.9	11.2	1.0	8.5	6.6

4.3.19.5.4.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Miles of the Project in VRM Management Class, by field office and alternative, are described in Table 4-127.

Table 4-127
Visual Resource Management Classes Miles Crossed by Field Office in Segment 2

Alternative Route	Total Miles	Lander Field Office	Rawlins Field Office	Rock Springs Field Office			Unclassified
		Class III	Class III	Class II	Class III	Class IV	
2A: Proposed Action	129.1	19.4	10.6	8.5	25.2	57.3	8.1
2B: Southern Route	136.2	19.4	10.6	19.0	23.7	51.1	12.4

4.3.19.5.4.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Miles of the Project in VRM Management Class, by field office and alternative, are described in Table 4-128.

Table 4-128
Visual Resource Management Classes Miles Crossed by Field Office in Segment 3

Alternative Route	Total Miles	Casper Field Office		Lander Field Office			Unclassified
		Class III	Class IV	Class II	Class III	Class IV	
3A: Proposed Action	83.2	<0.1	9.8	0.0	15.3	14.9	42.9
3B: Lost Creek to Lost Cabin	73.0	0.0	0.0	0.0	15.3	35.7	22.0
3C: Lost Creek to Highway 20/26	101.4	0.0	4.6	0.0	15.3	30.2	51.3

4.3.19.5.4.4 230-Kilovolt Transmission Line

The 230kV transmission line providing power to the proposed Riley Ridge Sweetening Plant would cross through 1 mile of VRM Class IV and meet the definition of VRM Class IV Objectives, as viewed from identified KOP locations.

4.3.19.5.4.5 Mainline Valve Distribution Lines

Although the distribution lines would mostly cross BLM VRM Class III and Class IV lands, the lines could also cross areas of BLM VRM Class II. Where located in proximity to KOP locations in VRM Class II (e.g., KOP RS-1 Red Desert Backcountry Byway), these MLV distribution lines could potentially be buried or use solar power in these visually sensitive areas, through coordination with the BLM, to comply with BLM VRM management objectives.

4.3.19.6 Summary Comparison of Alternative Routes

4.3.19.6.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

4.3.19.6.1.1 Scenery

Scenery Residual Impacts

Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant is composed of four different alternative routes (Refer to Table 4-114). Alternative 1A: Proposed Action, the shortest route, would travel through landscapes modified by oil and gas development, except at the Green River. Alternatives 1A Variation: Dry Basin Draw and 1B: Dry Piney cross through similar landscapes that have been affected by previous oil developments and other cultural modifications. Alternative 1B: Dry Piney is the variation with the highest impacts on moderate sensitivity landscapes due to the alignment through Class B scenery with a moderate visual sensitivity. Alternative 1C: Figure Four is the longest route, yet it would introduce the least amount of moderate residual impacts, as it crosses through landscapes which are less sensitive with more cultural modifications through Segment 1. All other alternative routes will have a higher amount of residual moderate impacts. All alternative routes cross the Green River, and none of the alternative routes would result in high residual impacts.

4.3.19.6.1.2 Viewers

Viewers Residual Impacts

The linear KOP associated with Segment 1, KOP P-2 Green River Recreational Corridor, would present users with a linear clearing of vegetation, which is typical of pipeline construction, maintenance, and operation, through the riparian corridor adjacent to the Green River. Alternatives 1A: Proposed Action, 1A Variation: Dry Basin Draw, and 1B: Dry Piney would result in similar visual impacts in this area. Alternative 1C: Figure Four crosses the Green River in an area with agriculture on the east side of the river. Due to the vegetation type in the area, this clearing would revegetate much sooner than the northern crossing where natural vegetation is found. Through application of agency-required mitigation measures, including boring under the river and riparian vegetation, the effects on views would be minimized to the extent practicable.

Compliance

All alternative routes meet VRM Class objectives.

4.3.19.6.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

4.3.19.6.2.1 Scenery

Scenery Residual Impacts

Segment 2: Riley Ridge Sweetening Plant to the Bairoil Interconnect is composed of two alternative routes. (Refer to Table 4-114) Alternative 2A: Proposed Action is the shorter of the two alternative routes but has the higher amount of moderate residual impacts due to crossing a larger amount of visually

sensitive landscapes, such as Jack Morrow Hills and The Pinnacles SQRUs. Alternative 2B: Southern Route does not cross as much land with a moderate visual sensitivity; however, the alternative crosses through slightly more high visual sensitivity landscapes and the Steamboat Mountain SQRU. None of the alternative routes introduce high residual impacts.

4.3.19.6.2.2 Viewers

Viewers Residual Impacts

All three KOPs associated with Segment 2 would have views of similar geometric clearings typical of those found during the construction, maintenance, and operation of the Project and the right-of-way associated with it. For the views from linear KOP RS-1 Red Desert Backcountry Byway, the viewers would be introduced to a wide geometric band, associated with Alternative 2A: Proposed Action, which would parallel a large portion of the Red Desert Backcountry Byway. Viewers at KOP RS-3 Boars Tusk would have views of Alternative 2B: Southern Route, which would introduce a hard edge against the natural landscape vegetation over a panoramic landscape from an elevated point of view at the southern portion of the Boars Tusk, a recreational landmark. Views from KOP RS-2 U.S. Highway 191 would include a geometric band introduced by Alternative 2A: Proposed Action, the northern crossing, with more opportunities for strategic use of topographic screening. Alternative 2B: Southern Route would also affect viewers from KOP RS-2 U.S. Highway 191. This alternative would still be intermittently screened from viewers due to the natural topography of the landscape; however, it would be visible at a designated pullout crossing through a landscape designated for views of Wyoming's wildlife.

4.3.19.6.2.3 Compliance

All alternative routes meet VRM Class objectives.

4.3.19.6.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

4.3.19.6.3.1 Scenery

Scenery Residual Impacts

Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect is composed of three alternative routes. (Refer to Table 4-114) Alternative 3A: Proposed Action has the most residual impacts as it crosses through the less culturally modified landscapes. The other two alternative routes, Alternatives 3B: Lost Creek to Lost Cabin and 3C: Lost Creek to Highway 20/26, both cross through highly modified landscapes. Though all three alternative routes cross similar modified landscapes, Alternative 3B: Lost Creek to Lost Cabin would result in the least amount of residual impacts as it is the shortest alternative. Along with 3A: Proposed Action and 3B: Lost Creek to Lost Cabin, 3C: Lost Creek to Highway 20/26, the longest route, would not cross any high sensitivity landscapes. None of the alternative routes have high residual impacts.

4.3.19.6.3.2 Viewers

Viewers Residual Impacts

The views from linear KOPs L-1 U.S. Highway 287 and C-1 U.S. Highway 20 are influenced by existing cultural modification. KOP L-1 U.S. Highway 287 would have short-duration views of Alternative 3A: Proposed Action, resulting in a widening of the current utility corridor at a perpendicular crossing, which would occur in a highly modified landscape. All other Project alternative routes share the same alignment at the crossing of U.S. Highway 287. All three alternative routes would be visible from KOP C-1 U.S. Highway 20. Impacts resulting from Alternative 3A: Proposed Action would be short in duration due to the perpendicular crossing of the highway. As mentioned earlier, this area has been modified by previous

pipeline corridors and the remnant geometric shapes of the right-of-way are still visible from the highway. Impacts on views from Alternative 3B: Lost Creek to Lost Cabin would be similar to impacts on views from Alternative 3A: Proposed Action, as the alternative would also cross the KOP in a perpendicular manner. Impacts resulting from Alternative 3C: Lost Creek to Highway 20/26 would be more intense due to paralleling U.S. Highway 20 for approximately 40 miles, increasing the duration of these effects. None of the alternative routes would result in high residual impacts.

4.3.19.6.3.3 Compliance

All alternative routes meet VRM Class objectives.

4.3.20 Water Resources

The design and placement of Project facilities would be planned to avoid impacts on water resources to the extent feasible. In areas where ground disturbance associated with construction, operation, and maintenance of the Project would occur and could not be avoided, direct and indirect effects on water resources could occur.

4.3.20.1 Issues Identified for Analysis

Construction, operation, and maintenance of the Project could result in direct effects on water resources. The types of potential effects on water resources include:

- Erosion and resulting sedimentation of soils into surface waters
- Impacts related to surface-disturbing activities during construction, depending on the methods of construction used
- Water depletions due to consumptive water use during construction
- Petroleum or hazardous materials spills or leaks during construction and operation
- Down-hole releases from the injection well due to casing ruptures, casing erosion or inadequate installation practices
- Interruption or impacts on springs flow

Crossing of ephemeral, intermittent and perennial streams will be required for construction of the pipeline. Four different methods of pipeline installation will be used: (1) HDD, (2) flume and trench, (3) open cut, or (4) wetland crossing. The HDD method of crossing would eliminate any future ground surface disturbance associated with an operating company's required annual maintenance for bank stabilization and depth of cover control typically required for an open ditch crossing. The flume and trench method would be used in most situations where there is flowing water. Depending on the size of the drainage, the contractor would determine the proper size and number of flume pipes needed to handle expected volumes of water. The pipeline trench would be dug beneath the flumes. Spoils from the trench would be placed in an upland area that is protected through implementation of BMPs to prevent discharge back into the channel. The open cut method would be used when crossing dry arroyos, swales, and minor drainages that are not carrying water. Spoils from the trench would be placed in an upland area.

Monitoring and trench inspection areas will be defined in a monitoring and treatment plan submitted to the BLM, as the lead federal agency, for SHPO and consulting party review and concurrence. Pipeline construction operations within wetland boundaries would be reduced to a travel lane, ditch line, and spoil storage area. When backfilling a trench, no foreign material would be added to the channel and the channel would be recontoured as close as possible to original condition. These areas would be reclaimed as soon as possible to protect water quality. Information and BMPs for each type of water crossing are included in Section 2.2.3.10. The type of water crossing method employed by the contractor will depend on the type of waterbody that will be crossed. Due to the large number of drainage channels that are

anticipated to be encountered during construction, the type of water crossing method employed at the crossings will be included in the POD after a route is selected for construction.

If avoidance of surface water features is not possible, the temporary removal of riparian vegetation, grading of stream banks, and the placement of fill materials (e.g., culverts, stream crossing structures, or rip-rap) could result in increased sedimentation of streams without engineering controls during and after construction. Indirect effects from these activities could include alteration of the pattern, profile, or dimension of streams and increased destabilization of soils. Transport of fugitive dust and erosion may result in discharge of sediment into water resources. An increase in sedimentation indirectly related to surface disturbance could degrade water quality and the ecological function of water resources, including streams, wetlands, and riparian areas. Implementation of the BMPs discussed in the Applicant's POD and in Chapter 2 would significantly reduce the potential for negative impact on surface waterbodies due to construction of temporary access roads and installation of the pipeline. The potential for negative impacts to occur would increase during nontypical climactic events or other unexpected circumstances where an erosion control or other design feature failed due to improper installation or maintenance of the control feature. The exact types of crossings employed at specific resources are not available for this analysis but will be detailed in the POD developed for Project construction, which would be subjected to agency review and approval prior to any construction activities.

Another potential temporary impact on water resources could occur from depletions of streams, lakes or groundwater through withdrawals during Project construction. Per the Applicant's POD, approximately 80 acre-feet (26,000,000 gallons) of water is needed for hydrostatic testing. As indicated in Section 2.2.3.6, approximately 4.6 acre-feet (1,500,000 gallons) of water is needed for fugitive dust control for every 10 miles of pipeline construction or access road use. Approximately 15.3 acre-feet (5,000,000 gallons) of water is needed during the construction of the Riley Ridge Sweetening Plant. It is anticipated that approximately 164 acre-feet of water will be needed for fugitive dust control. The rights for use of water for hydrostatic testing and fugitive dust control purposes would be obtained, as needed, prior to construction, through permits or purchase contracts with owners of valid existing water rights. Water would be obtained from a permitted source for mixing with bentonite during directional drilling at the HDD crossings. Table 2-11 and Table 2-12 detail the anticipated water uptake and sources for construction activities. After selecting a route for construction, a water source(s) capable of providing a sufficient volume of water of acceptable water quality will be identified by the owner and proper permission(s) for water use will be obtained through the Wyoming Water Rights permitting process prior to beginning construction. It should be noted that the BLM does not approve water use.

Water quality could be directly and indirectly affected by accidental spills of petroleum or other harmful substances during construction. These spills could include oil, gas, mechanical fluids, concrete wastes, or pesticides.

Road improvements (refer to Section 2.2.1.7) necessary for the construction of the Project could provide indirect effects on surface water resources. Improvements to stream crossings could result in temporary, minor discharges of sediment but could, over the long term, preempt or reduce impacts associated with Project operation and maintenance potentially reducing sedimentation and erosion.

Potential impacts on water resources are related to Project construction, operations, and maintenance. Indirect effects on water resources could be attributed to accidental spills of environmentally harmful substances, such as petroleum products and herbicides/pesticides. To reduce the potential for adverse effects on water resources by environmentally harmful substances, the Applicant would follow the Hazardous Materials Management and Spill Prevention, Control, and Countermeasures Plan of the POD (Appendix K).

Groundwater surface discharges, such as springs, are important water resources in the open and arid ecosystem in Wyoming. Springs are typically found along slopes where shallow groundwater intersects the land surface. If construction intersects shallow groundwater contributing to the flow of streams, the potential long-term indirect effects on springs include alteration, disruption, or destroying the flow of the springs by construction activities and placement of the pipeline within the hydrologic footprint of these features.

4.3.20.2 Criteria for Assessing Impacts

Criteria were developed to assess the intensity of potential effects on water resources associated with implementation of the Project. Table 4-129 describes the criteria developed to assess the level of impacts on water resources. The impact levels were derived by comparing the vulnerability of a water resource to potential impact. For purposes of analysis in the EIS to allow for the comparison of alternative routes, direct or indirect effects were assumed to result in the same level of impacts on water resources. Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

Table 4-129
Criteria for Assessing Level of Impacts on Water Resources

Level of Impact	Description
High	▪ Permanent loss of any wetland or other water resource ▪ Deposition of materials into Section 303(d) or 305(b)-listed impaired waters ▪ Deposition of materials into Wyoming "waters of the state" ▪ Effects on natural springs ▪ Effects on deep, shallow, or perched aquifers containing Class I, II, III, and Special A groundwater (Ch. 8, DEQ regulations) ▪ Effects on drinking water supply
Low	▪ Temporary impacts on wetlands and other water resources ▪ Temporary increases in sedimentation to surface water resources

4.3.20.3 Mitigation Planning

Initial impacts are those effects resulting from the implementation of the Project, including implementation of design features of the Proposed Action for environmental protection (Table 2-18). Initial impacts were assigned using the criteria presented in Table 4-129. The specific design features of the Proposed Action for environmental protection relevant to surface water resources include:

- **Design Feature 5 (roads – general design).** Applied to areas with excessive grades (roads, road embankments, ditches, and drainages) to avoid areas with erodible soils. Special construction techniques would be used, where applicable.
- **Design Feature 6 (access roads – general design).** Applied to ensure that access roads would be located to follow natural contours where possible and minimize side hill cuts.
- **Design Feature 9 (roads reclamation).** Applied to ensure that abandoned roads and roads that are no longer used would be recontoured and revegetated.
- **Design Feature 10 (soils – erosion control).** Applied to provide permanent erosion-control devices during Project construction.
- **Design Feature 11 (soils – topsoil handling).** Applied to ensure that topsoil from all excavation and construction activities would be salvaged and reapplied during reclamation.
- **Design Feature 12 (soils – wet soils during construction).** Applied to construction activities when soils are wet.

- **Design Feature 21 (mitigation measure development).** Applied to establish mitigation measures, as needed, based on the mutual agreement of Denbury and the BLM, to address changing conditions or requirements within the Project area throughout the operational phase.
- **Design Feature 25 (waste management disposal).** Applied to ensure that waste would be properly containerized and removed periodically for disposal at appropriate off-site permitted disposal facilities.
- **Design Feature 26 (waste management wastewater).** Applied to any wastewater generated in association with temporary, portable sanitary facilities and disposed of in accordance with applicable state and local laws and regulations.
- **Design Feature 27 (water stormwater pollution prevention plan).** Applied to ensure that an SWPPP would be developed and submitted for approval and that it would be followed during construction.
- **Design Feature 28 (water – road drainage).** Applied to ensure that existing drainage systems would not be altered, especially in sensitive areas, such as erodible soils or steep slopes.
- **Design Feature 29 (waters – water bodies and wetlands).** Applied to avoid waters of the U.S., including wetlands, to the maximum extent practicable.
- **Design Feature 30 (waters – water bodies and wetlands [construction]).** Applied to ensure that any construction that is in or adjacent to wetlands and streams would use Applicant-committed BMPs (refer to Applicant-committed environmental protection measures listed to protect surface water quality and to minimize impacts on those resources).
- **Design Feature 31 (water – control of qquatic and invasive species).** Applied to ensure that all construction equipment that contacts water would be cleaned using high pressure (minimum 3000 psi) hot water (140 degrees F).
    - Residual impacts represent anticipated impacts on water resources that would remain after implementation of agency-required mitigation measures (refer to Table 4-2). The agency-required mitigation measures applied to avoid, reduce, or minimize impacts on surface water resources include:
- **Agency-Required Mitigation Measure 1 (sensitive resource avoidance).** Applied to avoid or reduce impacts on surface water and groundwater resources, streams, wetlands and riparian areas and springs. Sensitive groundwater areas would be avoided during construction.
- **Agency-Required Mitigation Measure 3 (minimizing or avoiding disturbance to sensitive soils and vegetation).** Applied where soils and vegetation are particularly sensitive, including areas within 500 feet (153 meters) of streams, wetlands, water, and riparian vegetation communities.

Table 4-130 includes types of surface water resources affected by the implementation of the Project, including initial and residual impacts, and the agency-required mitigation measures to be used.

Table 4-130 Summary of Initial and Residual Impacts on Water Resources			
Resource	**Initial Impact**	**Agency-Required Mitigation Measure**	**Residual Impact**
Ephemeral Streams	High	3	Low
Intermittent Streams	High	3	Low
Impaired Streams	High	3	Low
Perennial Streams	High	1, 3	Low
Groundwater	High	1	Low
Springs	High	1	Low
NOTE: Initial impacts reflect implementation of the design features of the Proposed Action for environmental protection, which are considered to be part of the Applicant's Project description (and include the Applicant-committed measures [Appendix A]). Residual impacts reflect the anticipated effects that would remain afterimplementation of agency-required mitigation measures.			

4.3.20.4 Results (Direct and Indirect Residual Effects)

Inventory and impact results for this section are displayed on MV-12.

4.3.20.4.1 Surface Water

Without mitigation, surface water resources, including ephemeral, intermittent, impaired, and perennial streams, could be highly affected by construction operations across surface drainage channels. The types of negative effects would include erosion of disturbed soils and permanent sedimentation in stream channels. By implementing Agency-Required Mitigation Measure 1 at ephemeral, intermittent, impaired, and perennial surface water crossings and Agency-Required Mitigation Measure 3 at perennial surface water crossings, the anticipated long-term residual impacts on surface water resources would be low. However, some temporary effects, such as temporary sedimentation associated with surface disturbance and subsequent erosion and sedimentation associated with construction activities could occur. The requirements of a SWPPP would be followed to significantly reduce the potential of soil erosion and subsequent deposition into streams.

Another potential and temporary effect on surface water would occur from depletions of streams from water withdrawals during Project construction and the effect on downstream users, and local and downstream wildlife. If surface waterbody elevations decrease due to natural or human influences, the location of withdrawal may change and could present a safety issue if a non-conventional withdrawal location is used. Water will be required for Project use as hydrostatic testing fluid and during construction of the pipeline. The proposed water sources were identified in Section 2.2.3.5 and Section 2.2.3.6. Where available, the average annual water flow records were obtained from the online Water Data for the Nation stream gage database (USGS) for four surface water sources. The minimum average annual flow for the recorded time period was used as a conservative estimate of the average flow rate of the streams. A summary of the results is shown in Table 4-131. Based on the information summarized in Table 4-131, the volume removed for construction represents less than 1 percent of the annual water volume. Therefore, the potential impact on downstream receptors is low. Stream gage data for the remaining stream (Middle Casper Creek) was not available. However, Middle Casper Creek serves as a tributary to the Middle North Platte River. Data for the remaining surface water sources, which consisted of streams and reservoirs, were not located. Therefore, based on the data gap for remaining sources, the potential impacts on downstream receptors could not be directly quantified.

Table 4-131
Potential Surface Water Sources

Anticipated Source[1,2]	Alternative Route	Potential Water Withdrawal (acre-feet)	Total Average Annual Flow (acre-feet)	Percent of Water Removed
Green River	1A, 1B, 1C	35.9	553,326	0.006
Big Sandy River	2A	38.9	23,893	0.16
Little Sandy Creek	2A	4.3	4,633	0.09
Sweetwater River	3A, 3B, 3C	24.6	18,680	0.13

NOTES:
[1]Sources identified for the Proposed Action.
[2]Surface water sources with known information. The flow rate and volume of other sources was not identified.

The water source availability depends on the Preferred Alternative that will be selected. Surface water availability and quality, particularly in the Red Desert region, can vary significantly seasonally and during different water years. After selecting a Preferred Alternative, one or more water source(s) of sufficient quantity and quality will be identified by the owner and proper permission(s) for water use will be obtained through the Wyoming Water Rights permitting process prior to beginning construction. The BLM does not approve water sources. If surface water is used as a potential source, potential depletion of surface water may impact wildlife and permits may also be required from the Department of Fish and Wildlife. If necessary, permits will be secured prior to use of the surface water source.

4.3.20.4.1.1 No Action Alternative

Under the No Action Alternative, a right-of-way grant across BLM-administered lands would not be granted. The Project would not be developed and the environment would remain as it presently exists.

4.3.20.4.1.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction and Injection Wells

The proposed Riley Ridge Sweetening Plant and injection wells are not located adjacent to any surface water sources. Therefore, no impacts on surface water are anticipated from construction or operation of these facilities.

Segment 1 Pipeline Alternative Routes

Table 3-136 summarizes the type and number of stream classes crossed by Segment 1 of the Project area. Alternative 1A: Proposed Action crosses 4 Class 2A streams and 2 waterbodies given a rating as a PFC. No other streams were surveyed along Segment 1 using the PFC method. The 2-mile study corridor contains 229 mapped lotic waters including 13 perennial streams; 176 intermittent streams; and 40 canals, connectors, or artificial paths. With the application of agency-required mitigation measures discussed in Section 4.3.20.3, only low, short-term residual effects on surface water resources would be anticipated as a result of surface disturbance during construction and the potential for a temporary increase in sedimentation and erosion. No waters crossed by alternative routes in Segment 1 are listed on the CWA 303(d) list of impaired waters by the WDEQ.

Alternative 1A Variation: Dry Basin Draw crosses the same type and number of the stream classes along the shared portion of the segment and no waterbodies were surveyed along Alternative 1A: Proposed Action using the PFC method. The 2-mile study corridor contains 13 fewer perennial waters, 123 fewer intermittent waters and 25 fewer canals, connectors or artificial paths. Similarly, with the application of agency-required mitigation, only temporary effects on water resources due to the potential increase of sedimentation and erosion from surface disturbances could result in similar low residual impacts as Alternative 1A: Proposed Action.

Alternative 1B: Dry Piney crosses 3 Class 2A streams, 1 Class 3B stream, and 2 waterbodies given a rating as a PFC. No other streams were surveyed along Alternative 1B: Dry Basin Draw using the PFC method. Surface disturbance due to construction could result in disturbance of 1 fewer Class 2AB stream, but 1 additional Class 3B stream compared to Alternative 1A: Proposed Action. The 2-mile study corridor contains 32 additional perennial waters; 28 additional intermittent waters; and 20 additional canals, connectors, or artificial paths. Similarly, with the application of agency-required mitigation, only temporary effects on water resources would occur due to the potential increase of sedimentation and erosion from surface disturbances.

Alternative 1C: Lost Creek to Highway 20/26 crosses 5 Class 2A streams, 3 Class 3B streams, and 1 waterbody given a rating as a PFC. No other streams were surveyed along Alternative 1C: Figure Four using the PFC method. Surface disturbance due to construction could result in disturbance of 1 more Class 2AB stream, 3 additional Class 3B streams, but 1 fewer water body given a rating as a PFC by the BLM compared to Alternative 1A: Proposed Action. The 2-mile study corridor contains 25 additional perennial waters; 48 additional intermittent waters; and 14 additional canals, connectors, or artificial paths. Similarly, with the application of agency-required mitigation, only temporary effects on water resources would occur due to the potential increase of sedimentation and erosion from surface disturbances.

4.3.20.4.1.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Table 3-136 summarizes the type and number of stream classes crossed by Segment 2 of the Project area. Initial impacts for surface waters would be moderate.

Alternative 2A: Proposed Action crosses 3 Class 2AB streams, 1 Class 2C stream, 6 Class 3B streams, and 3 waterbodies given a rating as a PFC. No other streams were surveyed along Alternative 2A: Proposed Action using the PFC method. The 2-mile study corridor contains 938 mapped lotic waters including 74 perennial streams; 797 intermittent streams; and 67 canals, connectors, or artificial paths. One impaired water (Little Sandy River) crosses Alternative 2A. With the application of agency-required mitigation measures discussed in Section 4.3.20.3, only low, short-term residual effects on surface water resources would be anticipated as a result of surface disturbance during construction and the potential for a temporary increase in sedimentation and erosion.

Alternative 2B: Southern Route crosses 2 Class 2AB streams, 8 Class 3B stream, and 1 waterbody given a rating as a PFC. No other streams were surveyed along Alternative 2B: Southern Route using the PFC method. Surface disturbance due to construction could result in disturbance of 1 fewer Class 2AB and Class 2C streams, but 2 additional Class 3B streams compared to Alternative 2A: Proposed Action. Alternative 2B: Southern Route would also cross 2 fewer waterbodies given a rating as a PFC by the BLM. The 2-mile study corridor contains 23 fewer perennial waters; 122 fewer intermittent waters; and 19 fewer canals, connectors, or artificial paths. No impaired water crosses Alternative 2B: Southern Route. Similarly, with the application of agency-required mitigation, only temporary effects on water resources would occur due to the potential increase of sedimentation and erosion from surface disturbances. The cleanup and reclamation activities specified in the Applicant's POD and in Appendix H of the POD (Stormwater Pollution Prevention Plan) will further reduce the potential for impact on surface waterbodies. Specific BMPs include installing site perimeter erosion controls, active monitoring and implementation of additional erosion controls during construction (if necessary), installation of berms, water bars, slash material, rock, ground matting, wattles, and reseeding disturbed areas. The BMPs will be added as needed to protect the construction site from erosion and stabilize the site after construction is complete.

Without mitigation, the types of effects would include permanent sedimentation and erosion from surface-disturbing activities. Agency-Required Mitigation Measure 1 would be applied to ephemeral, intermittent, impaired, and perennial surface waters. Agency-Required Mitigation Measure 3 would only be applied to perennial surface waters. Thus, any impacts on streams would be anticipated to be low, although some temporary effects, such as temporary sedimentation associated with surface disturbance and subsequent erosion and sedimentation associated with construction activities, could occur. The cleanup and reclamation activities specified in the applicant's POD and in Appendix H of the POD (Stormwater Pollution Prevention Plan) will further reduce the potential for impact on surface waterbodies.

4.3.20.4.1.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Table 3-136 summarizes the type and number of stream classes and waterbodies given a rating as a PFC by the BLM crossed by Segment 3 of the Project area. Initial impacts for surface waters, including intermittent, impaired, and perennial streams, would be moderate. An impaired water (Crooks Creek) is located along the shared portion of Segment 3.

Alternative 3A: Proposed Action crosses 3 Class 2AB streams, 15 Class 3B streams, and 1 waterbody given a rating as a PFC. No other streams were surveyed along Alternative 3A: Proposed Action using the PFC method. The 2-mile study corridor contains 447 mapped lotic waters, including 32 perennial streams, 337 intermittent streams, and 78 canals, connectors or artificial paths. With the application of agency-required mitigation measures discussed in Section 4.3.20.3, only low, short-term residual effects on surface water resources would be anticipated as a result of surface disturbance during construction and the potential for a temporary increase in sedimentation and erosion.

Alternative 3B: Lost Creek to Lost Cabin crosses 2 Class 2AB streams, 1 Class 2B stream, 8 Class 3B streams, and 1 Class 4 stream. Surface disturbance due to construction could result in disturbance of 1 fewer Class 2AB and 7 fewer Class 3B streams, but 1 additional Class 2C and Class 4 stream compared to Alternative 3A: Proposed Action. The 2-mile study corridor contains 23 fewer perennial waters, 101 fewer intermittent waters and 8 fewer canals, connectors or artificial paths. Alternative 3B: Lost Creek to Lost Cabin crosses no waterbodies surveyed using the PFC method. Similarly, with the application of agency-required mitigation, only temporary effects on water resources would occur due to the potential increase of sedimentation and erosion from surface disturbances.

Alternative 3C: Lost Creek to Highway 20/26 crosses 2 Class 2AB streams, 3 Class 2B streams, and 8 Class 3B streams. Surface disturbance due to construction could result in disturbance of 1 fewer Class 2AB and 7 fewer Class 3B streams, but 3 additional Class 2C streams compared to Alternative 3A: Proposed Action. Alternative 3B: Lost Creek to Lost Cabin crosses no waterbodies surveyed using the PFC method. The 2-mile study corridor contains 26 fewer perennial waters; 45 additional intermittent waters; and 17 additional canals, connectors, or artificial paths. Similarly, with the application of agency-required mitigation, only temporary effects on water resources would occur due to the potential increase of sedimentation and erosion from surface disturbances.

Without mitigation, the types of effects would include permanent sedimentation and erosion from surface-disturbing activities. With implementation of agency-required mitigation, impacts on surface water resources would be anticipated to be low, although some temporary effects, such as temporary sedimentation associated with surface disturbance and subsequent erosion and sedimentation associated with construction activities, could occur. The cleanup and reclamation activities specified in the applicant's POD and in Appendix H of the POD (Stormwater Pollution Prevention Plan) will further reduce the potential for impact on surface waterbodies.

4.3.20.4.1.5 230-Kilovolt Transmission Line

The construction of a 230kV transmission line to the proposed Riley Ridge Sweetening Plant would not cross water resources and, as such, is not expected to result in residual impacts on water resources. The disturbance associated with the 230kV line has been included in the estimated disturbance to surface water resources presented in Table 4-3.

4.3.20.4.1.6 Mainline Valve Distribution Lines

The MLV distribution lines are expected to result in temporary disturbance to water resources crossed. Without knowing the final location of the distribution lines, the amount of disturbance to water resources resulting from the construction of the distribution lines cannot be provided at this time. However, estimates of disturbance resulting from distribution line construction have been incorporated into the expected amounts of temporary and permanent disturbance to water resources presented in Table 4-3.

Application of design features and agency-required mitigation measures to reduce impacts associated with construction of the distribution lines would be consistent with the rest of the Project. In addition, where the distribution lines would cross water resources, the MLV may instead be powered through an on-site solar power system, which would effectively limit the amount of expected disturbance.

4.3.20.4.2 Groundwater

No designated drinking water supplies, sole aquifers, wellhead protection zones, or other public drinking water supply resources would be affected by the Project or any of its alternative routes. Thus, no identifiable impacts on groundwater resources utilized for public water supplies would be anticipated. Wells used to supply water for dust control, hydrostatic testing or other project uses should be legally permitted for such uses by the State of Wyoming and, where discharge of this water after its use is required, of a quality that is consistent with the project's discharge permit(s).

As shown in MV-12, there are multiple springs in each segment where groundwater discharges at the surface. Springs are the only remaining issue identified in Section 4.3.20.1 for groundwater resources occurring within the study area.

The two acid gas H_2S injection wells will be drilled to approximately 20,000-feet below ground surface. Both injection wells will be constructed with multiple protective cement sleeves and liners to protect shallow and deep aquifers as required by the UIC program. Operational and well integrity reporting requirements will be in accordance with the conditions set forth in the Class II injection permit issued by the WOGCC. The injection wells will be completed with casing sealed with a series of cement sleeves intended to protect groundwater resources. Cement will be placed at depths extending from 15,000 feet to the ground surface. The cement will be placed to protect shallow groundwater resources (2,000 feet to the ground surface), the Nugget Formation and hydrocarbon-bearing zones in the Frontier Formation (15,000 feet to 2,000 feet). A second intermediate casing will consist of a nominal 7.58-inch casing set from approximately 16,400 feet to the surface with heavy wall casing installed from 16,400 to 15,000 feet. The heavy wall casing will be set through the Thaynes Formation, which has salt zones that present well integrity and drilling problems. A production liner would be set to an expected total depth of approximately 19,900 feet. The potential Madison and Big Horn disposal zones may be encountered between approximately 17,700 and 19,700 feet. The 5-inch production liner would be set at total depth and cemented to the bottom of the second intermediate casing using acid-resistant cement. The casing and cementing program is described in further detail in Section 2.2.1.2 of Chapter 2 and in a schematic included in the POD.

Operational emergency responses would be conducted in accordance with USDOT PHMSA requirements. PHMSA ensures safety in the design, construction, operations and maintenance, and spill

response of the planning for pipelines in the U.S. that transport natural gas and hazardous liquids. The PHMSA design and emergency response requirements would avoid groundwater resources. As discussed in Section 3.2.20.4, aquifer sensitivity is the relative ease with which a contaminant applied on the land surface can migrate to the shallowest aquifer. Construction projects that use heavy equipment require consumption of fuels, oils and lubricating greases. Due to the potential for accidental releases of petroleum products, the relative aquifer sensitivity was examined.

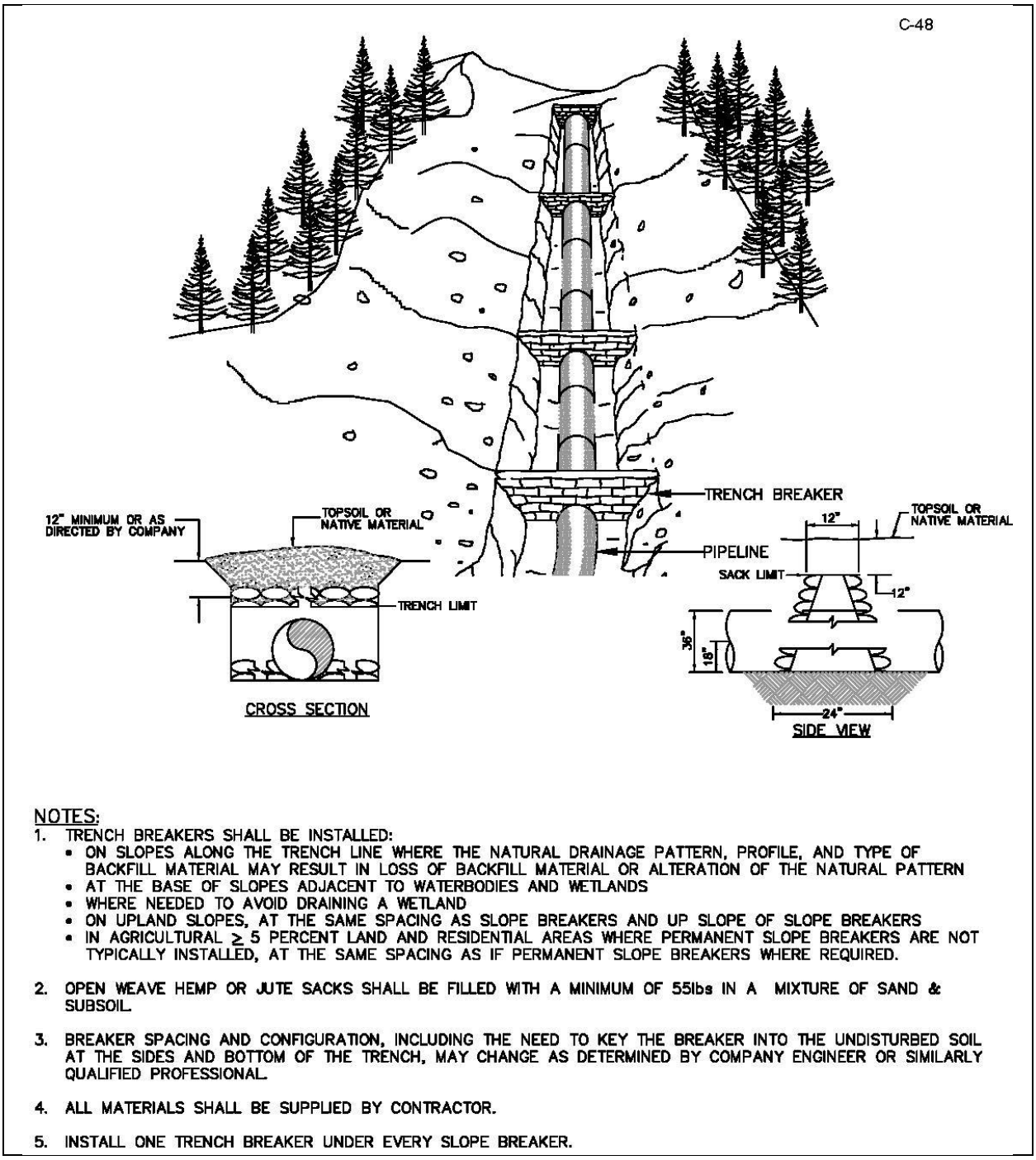
As discussed in Section 3.2.20.4, a quantitative estimate of the sensitivity of an aquifer to contaminants applied to the ground surface had been calculated by the Wyoming Groundwater Vulnerability Mapping project. The relative aquifer sensitivity is divided into five categories ranging from low (12) to high (greater than 43). A greater potential for groundwater impact from contaminants released at the ground surface corresponds to a higher aquifer sensitivity number. Mitigation and operational risk management for pipeline leaks related to public safety are addressed in the Applicant's POD (Appendix K, Hazardous Materials Management and Spill Prevention, Control, and Countermeasure Plan). The POD specifies BMPs that will be employed to prevent and respond to accidental releases of hazardous materials.

Several methods were used to analyze the potential impacts on springs and seeps in the vicinity of the pipeline. Groundwater flows in response to a pressure gradient, which means it will move from an area of higher pressure to an area of lower pressure. Typically for unconfined aquifers groundwater generally follows topography and does not flow uphill (i.e., across topographic ridges). However, pressure gradients for some confined aquifers can flow differently than shallow unconfined aquifers, including opposite or cross-gradient to the topographic ground surface. For analytical purposes, due to the shallow anticipated depth of the trench (30 to 60 inches below ground surface) it is assumed that pipeline crossings on unconsolidated alluvial material could potentially encounter shallow unconfined groundwater conditions where groundwater generally flows along the same gradient as topography. If a spring is located in alluvial sediments perpendicular to the pipeline it is referred to as hydraulically down-gradient. If a spring is located on a non-perpendicular path below the pipeline it is referred to as hydraulically cross-gradient. Alternatively, since shallow confined units may be encountered in bedrock, no assumptions of groundwater flow direction were made where the pipeline crosses bedrock.

If shallow groundwater associated with springs (or other sources) is encountered during pipeline construction, the trench would be temporarily dewatered and the water discharged consistent with the Project's discharge permits as described in Sections 3.5 and 4.4 of the Applicant's POD. To inhibit the movement of shallow groundwater through the pipeline backfill following construction, trench plugs/breakers would be installed during the pipeline placement to maintain historic groundwater flowpaths as described in Section 9.4 of the Applicant's POD and illustrated in Figure 4-4 and Figure 4-5.

4.3.20.4.2.1 No Action Alternative

Under the No Action Alternative, a right-of-way grant across BLM-administered lands would not be granted. The Project would not be developed and the environment would remain as it presently exists.



NOTES:

1. TRENCH BREAKERS SHALL BE INSTALLED:
   - ON SLOPES ALONG THE TRENCH LINE WHERE THE NATURAL DRAINAGE PATTERN, PROFILE, AND TYPE OF BACKFILL MATERIAL MAY RESULT IN LOSS OF BACKFILL MATERIAL OR ALTERATION OF THE NATURAL PATTERN
   - AT THE BASE OF SLOPES ADJACENT TO WATERBODIES AND WETLANDS
   - WHERE NEEDED TO AVOID DRAINING A WETLAND
   - ON UPLAND SLOPES, AT THE SAME SPACING AS SLOPE BREAKERS AND UP SLOPE OF SLOPE BREAKERS
   - IN AGRICULTURAL ≥ 5 PERCENT LAND AND RESIDENTIAL AREAS WHERE PERMANENT SLOPE BREAKERS ARE NOT TYPICALLY INSTALLED, AT THE SAME SPACING AS IF PERMANENT SLOPE BREAKERS WHERE REQUIRED.
2. OPEN WEAVE HEMP OR JUTE SACKS SHALL BE FILLED WITH A MINIMUM OF 55lbs IN A MIXTURE OF SAND & SUBSOIL.
3. BREAKER SPACING AND CONFIGURATION, INCLUDING THE NEED TO KEY THE BREAKER INTO THE UNDISTURBED SOIL AT THE SIDES AND BOTTOM OF THE TRENCH, MAY CHANGE AS DETERMINED BY COMPANY ENGINEER OR SIMILARLY QUALIFIED PROFESSIONAL.
4. ALL MATERIALS SHALL BE SUPPLIED BY CONTRACTOR.
5. INSTALL ONE TRENCH BREAKER UNDER EVERY SLOPE BREAKER.

Figure 4-4 Typical Trench Breaker Requirements

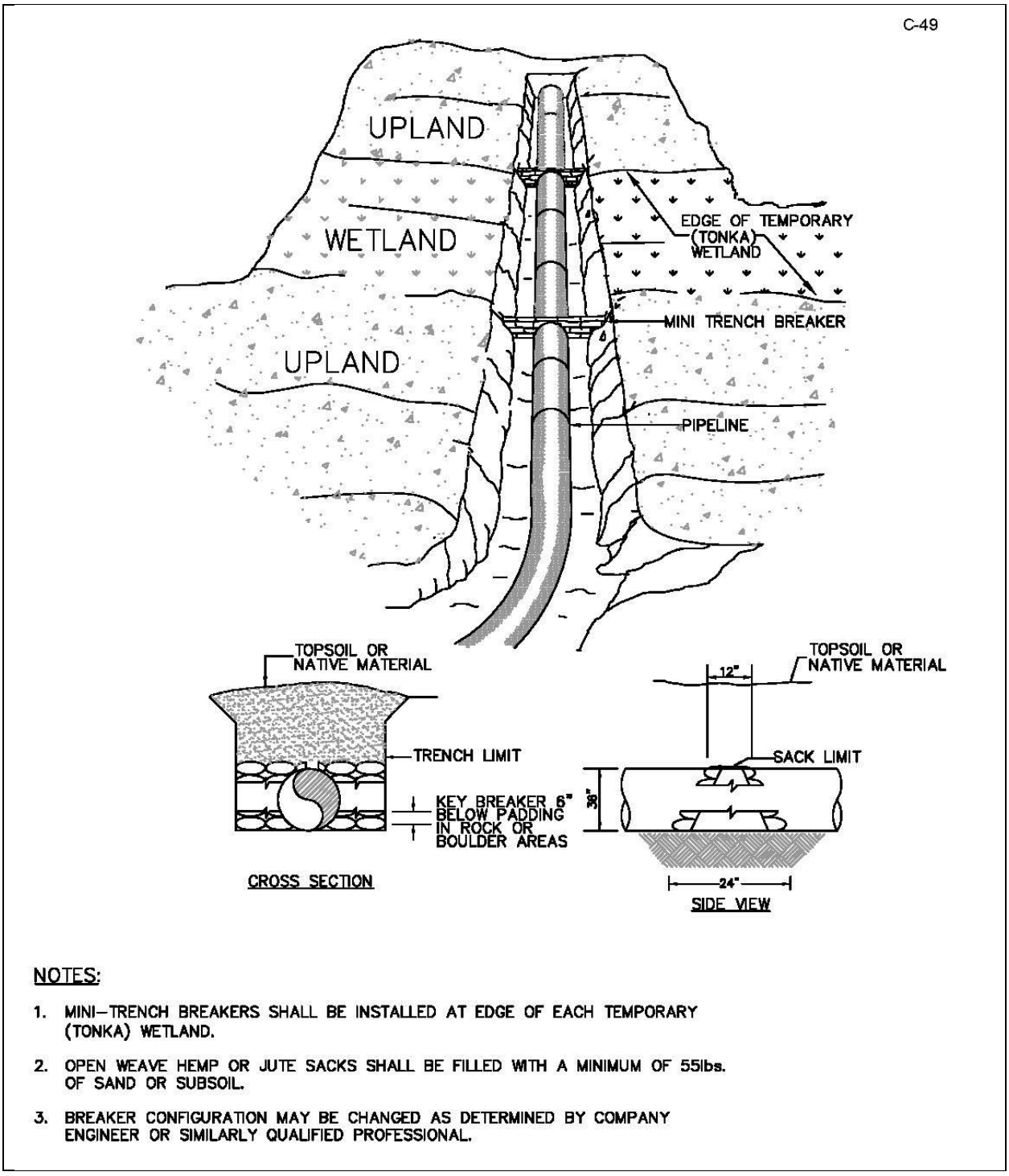


Figure 4-5 Typical Mini-Trench Breaker

4.3.20.4.2.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction

Based on the assumed groundwater flow direction toward local and regional drainages, one spring is located east of the Riley Ridge Sweetening Plant. Without mitigation, including Agency-Required

Mitigation Measure 1 (sensitive resource avoidance), Agency-Required Mitigation Measure 3 (minimizing or avoiding disturbance to sensitive soils and vegetation), and Agency-Required Mitigation Measure 8 (interim and intense reclamation), this spring could be affected by construction-caused hydrologic alterations or disruptions, resulting in high impacts. Hydrologic alterations or disruptions could diminish or eliminate the groundwater discharge and existence of the springs. The potential for long-term impacts on the springs can be reduced by following the mitigation measures during construction, as specified in the POD (Appendix A). Using these mitigation measures, residual impacts would be anticipated to be low.

Injection Wells

Two H_2S injection wells will be located on separate 3.9-acre well pads near the Riley Ridge Sweetening Plant. The wells will be drilled to maximum depths of 19,860 feet below ground surface targeting injection zones in the Madison Limestone and Big Horn Dolomite (Appendix A) and will be entirely encased with multiple layers of protective cement sleeving and liners to protect shallow and deep aquifers as required by the UIC program administered by the WOGCC for Class II injection wells. A diagram that summarizes the injection well design is provided in Figure 2-1. Class II injection well design requirements of the WOGCC are intended to ensure that injection wells are constructed to prevent the migration of fluids outside the injection zone, thereby protecting groundwater resources. BMPs described in Appendices H and K of the POD (Appendix A) will protect shallow groundwaters during the drilling and construction phase. Drilling cuttings and waste will be contained in a closed loop system with no reserve pits (Appendix A) and, following well completion, these drill wastes will be disposed off-site at an approved facility. Additional groundwater protection and reporting requirements will be in accordance with the conditions set forth in the permit issued by the WOGCC and will provide ongoing demonstration that the operation of the two injection wells is not threatening human health or the environment.

The wells will inject into the Madison Limestone and Big Horn Dolomite. The injected formations outcrop at or near the surface at the base of the Wyoming Range Mountain uplifts located approximately 24 miles west of the injection well site and approximately 13 miles west of the Green River. If injected materials migrate laterally to outcrop at the surface, they may negatively impact surface water quality or groundwater quality if wells use the injected formations as a water source. Without mitigation, including Agency-Required Mitigation Measure 1 (sensitive resource avoidance), Agency-Required Mitigation Measure 3 (minimizing or avoiding disturbance to sensitive soils and vegetation), and Agency-Required Mitigation Measure 8 (interim and intense reclamation), one unnamed spring crossed by Alternative 1A: Proposed Action and one spring (DeGraw Spring) near Alternative 1C: Figure Four could be affected by construction-caused hydrologic alterations or disruptions, resulting in high impacts. Hydrologic alterations or disruptions could diminish or eliminate the groundwater discharge and existence of the springs. The potential for long-term impacts on the springs can be reduced by following the mitigation measures during pipeline construction, as specified in the POD (Appendix A). Using these mitigation measures, residual impacts would be anticipated to be low. Based on topographic analysis and the position of the remaining springs relative to the pipeline, the possibility of affecting water quality or quantity at the remaining springs identified in this EIS is low.

Segment 1 Pipeline Alternative Routes

A total of seven springs are located within a 2-mile corridor along Segment 1. Four springs are located within unconsolidated alluvial deposits, and the remaining three springs occur in bedrock near the margins of the unconsolidated sediments. Five springs are located either cross-gradient to the pipeline, on opposite sides of drainage divides or drainages or higher in elevation than the pipeline, or a combination of these traits. Based on the assumed groundwater flow direction toward local and regional drainages, the remaining two springs are located hydraulically down-gradient of the pipeline. The springs that are

potentially affected include one along the shared route alignment east of the Riley Ridge Sweetening Plant and DeGraw Spring along Alternative 1C: Figure Four.

The aquifer sensitivity along Segment 1 ranges from low Sensitivity to high Sensitivity and the majority of the segment crosses medium-low to medium sensitivity areas. High sensitivity aquifers along Segment 1 are generally located in alluvial (Quaternary) sediments.

Without mitigation, including Agency-Required Mitigation Measure 1 (sensitive resource avoidance), Agency-Required Mitigation Measure 3 (minimizing or avoiding disturbance to sensitive soils and vegetation), and Agency-Required Mitigation Measure 8 (interim and intense reclamation), one unnamed spring crossed by Alternative 1A: Proposed Action and one spring (DeGraw Spring) near Alternative 1C: Figure Four could be affected by construction-caused hydrologic alterations or disruptions, resulting in high impacts. Hydrologic alterations or disruptions could diminish or eliminate the groundwater discharge and existence of the springs. The potential for long-term impacts on the springs can be reduced by following the mitigation measures during pipeline construction, as specified in the POD (Appendix A). Using these mitigation measures, residual impacts would be anticipated to be low. Based on topographic analysis and the position of the remaining springs relative to the pipeline, the possibility of affecting water quality or quantity at the remaining springs identified in this EIS is low.

4.3.20.4.2.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

A total of 26 springs are located along a 2-mile corridor of Segment 2, with 31 springs along Alternative 2A: Proposed Action and 21 springs along Alternative 2B: Southern Route. Two springs are located within unconsolidated alluvial deposits. The remaining 24 springs occur in bedrock. There are 8 springs located hydraulically cross-gradient to the pipeline either on opposite sides of drainages or drainage divides or higher in elevation than the pipeline, or a combination of these traits. Based on the assumed groundwater flow direction toward local and regional drainages, the remaining 8 springs are in the potential recharge area for the springs. The springs that are potentially affected include three unnamed springs along the shared route alignment, seven springs (five unnamed springs, Juel Spring, and North Sublette Meadow Springs) along Alternative 2A: Proposed Action, and two springs (one unnamed spring and Chicken Springs) along Alternative 2B: Southern Route. Of particular interest are a series of four unnamed springs and Chicken Springs along Alternative 2A: Proposed Action near Bush Rim. Since the alternative pipeline route crosses bedrock through a potential recharge area, three unnamed springs and Chicken Springs are also potentially affected along Alternative 2A: Proposed Action. The Applicant reviewed the Chicken Springs area with members of the Rock Springs Field Office at an onsite meeting in 2014. At the 2014 meeting, the Applicant agreed to locate the pipeline on the east side of Bar X road, parallel to the road, through the Chicken Springs area. As a result of this routing, Chicken Springs will be located upslope of the pipeline and water flowing from the spring and reaching the pipeline would do so at or near a 90 degree crossing angle. During pipeline construction, the applicant would install trench breakers throughout the Chicken Springs area at a spacing not to exceed 500 feet to maintain historic flow patterns (Figure 4-4 and Figure 4-5).

Without mitigation, including Agency-Required Mitigation Measure 1 (sensitive resource avoidance), Agency-Required Mitigation Measure 3 (minimizing or avoiding disturbance to sensitive soils and vegetation), and Agency-Required Mitigation Measure 8 (interim and intense reclamation), the springs crossed by Alternative 2A: Proposed Action and Alternative 2B: Southern Route could be affected by construction-caused hydrologic alterations or disruptions, resulting in high impacts. Hydrologic alterations or disruptions could diminish or eliminate the groundwater discharge and existence of the springs. The potential for long-term impacts on the springs can be reduced by following the mitigation measures during pipeline construction, as specified in the POD. Using these mitigation measures, residual impacts would be anticipated to be low. Based on topographic analysis and the position of the remaining

springs relative to the pipeline, the possibility of affecting water quality or quantity at the remaining springs identified in this EIS is low.

As discussed in Section 3.2.20.4, a quantitative estimate of the sensitivity of an aquifer to contaminants applied to the ground surface had been calculated by the Wyoming Groundwater Vulnerability Mapping project. The aquifer sensitivity along Segment 2 ranges from low Sensitivity to high Sensitivity and the majority of the segment crosses medium-low to medium sensitivity areas. High sensitivity aquifers along Segment 2 are generally in alluvial (Quaternary) sediments. However, Quaternary aged playa lake and lacustrine segments that are located along the eastern portions of Segment 2 are associated with medium-low aquifer sensitivity.

4.3.20.4.2.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

A total of 10 springs are located within a 2-mile corridor along Segment 3, with 8 springs along Alternative 3A: Proposed Action, 5 springs along Alternative 3B: Lost Creek to Lost Cabin, and 7 springs along Alternative 3C: Lost Creek to Highway 20/26. One spring located along the shared Segment 3 route is located within unconsolidated alluvial deposits. The remaining 9 springs occur in bedrock. There are 6 springs located either on opposite sides of drainage divides or drainages, hydraulically cross-gradient to the pipeline, and/or are higher in elevation than the pipeline. Based on the assumed groundwater flow direction toward local and regional drainages, the remaining 4 springs are located hydraulically down-gradient of the pipeline. The springs that are potentially affected include one spring (Puddle Springs) along the shared route alignment and two springs (one unnamed spring and JE Sulphur Spring) along Alternative 3A: Proposed Action. With the exception of Puddle Springs, which is located along the shared route alignment, no additional springs exist along Alternative 3B: Lost Creek to Lost Cabin, and one spring (Waltman Spring) is present along Alternative 3C: Lost Creek to Highway 20/26.

Without mitigation, including Agency-Required Mitigation Measure 1 (sensitive resource avoidance), Agency-Required Mitigation Measure 3 (minimizing or avoiding disturbance to sensitive soils and vegetation), and Agency-Required Mitigation Measure 8 (interim and intense reclamation), the four springs that can potentially be affected by Alternative 3A: Proposed Action, Alternative 3B: Lost Creek to Lost Cabin, and Alternative 3C: Lost Creek to Highway 20/26 could be affected by construction-caused hydrologic alterations or disruptions, resulting in high impacts. Hydrologic alterations or disruptions could diminish or eliminate the groundwater discharge and existence of the springs. Using these mitigation measures, residual impacts would be anticipated to be low. Based on topographic analysis and the position of the remaining springs relative to the pipeline, the possibility of affecting water quality or quantity at the remaining springs identified in this report is low.

The aquifer sensitivity along Segment 3 ranges from low Sensitivity to high Sensitivity and the majority of the segment crosses medium-low to medium-high sensitivity areas. High sensitivity aquifers along Segment 3 are generally in alluvial (Quaternary) sediments.

4.3.20.4.2.5 230-Kilovolt Transmission Line

The 230kV transmission line is not expected to result in any direct or indirect effects on water resources since the transmission line will be constructed in an upland setting. Estimates of disturbance resulting from distribution line construction have been incorporated into the potential disturbance to groundwater resources as discussed in Section 4.3.20.4.

Application of design features and BMPs would further reduce potential effects on water resources.

4.3.20.4.2.6 Mainline Valve Distribution Lines

The MLV distribution lines are not expected to result in direct or indirect disturbance to groundwater resources. Without knowing the final location of the distribution lines, the amount of disturbance on groundwater resources resulting from the construction of the distribution lines cannot be provided at this time. However, estimates of disturbance resulting from distribution line construction have been incorporated into the potential disturbance to groundwater resources presented Section 4.3.20.4.

Application of design features and agency-required mitigation measures to reduce impacts associated with construction of the distribution lines would be consistent with the rest of the Project. In addition, where the distribution lines would cross groundwater resources, the MLV may instead be powered through an on-site solar power system, which would effectively limit the amount of expected disturbance.

4.3.20.5 Summary Comparison of Alternative Routes

In Segment 1, Alternative 1A: Proposed Action, Alternative 1A Variation: Dry Basin Draw, and Alternative 1B: Dry Piney all cross the Green River (on the same alignment) in a generally unmodified setting. Alternative 1C: Figure Four crosses the Green River in a different location but effects would be similar. Section 3.2.20.3 describes the lotic waters within this segment. Alternatives 1B: Dry Basin Draw and 1C: Figure Four cross a higher number of both perennial and intermittent streams compared to Alternative 1A: Proposed Action. Alternative 1A: Proposed Action has fewer residual impacts compared to the other alternative routes in this segment. No waters crossed by alternative routes in Segment 1 are listed on the CWA 303(d) list of impaired waters by the WDEQ. Alternative 1A: Proposed Action, Alternative 1A Variation: Dry Basin Draw, and Alternative 1B: Dry Piney cross one spring along the shared portions east of the Riley Ridge Sweetening Plant. Alternative 1C: Figure Four crosses two springs that may be affected by construction.

A quantitative estimate of the sensitivity of an aquifer to contaminants applied to the ground surface had been calculated by the Wyoming Groundwater Vulnerability Mapping project. The relative aquifer sensitivity is divided into five categories ranging from low (12) to high (greater than 43). A greater potential for groundwater impact from contaminants released at the ground surface corresponds to a higher aquifer sensitivity number. In regards to aquifer sensitivity, Alternative 1A: Proposed Action crosses the greatest high sensitivity aquifer classification area (5.8 miles or 19.1 percent). Alternative 1A Variation: Dry Basin Draw crosses 4.6 miles or 15.0 percent of high sensitivity aquifer along the segment length, Alternative 1B: Dry Piney crosses 5.5 miles or 15.9 percent of high sensitivity aquifer along the segment length, and Alternative 1C: Figure Four crosses 5.1 miles or 13.2 percent of high sensitivity aquifer.

In Segment 2, Alternative 2B: Southern Route crosses fewer perennial and intermittent streams, and fewer canals, connectors or artificial paths compared to Alternative 2A: Proposed Action. Segment 2 lentic waters include 85 intermittent lakes/ponds (3 named and 82 unnamed), 33 perennial lakes/ponds (2 named and 31 unnamed), 5 swamps/marshes (no named and 5 unnamed), and no reservoirs. Section 3.2.20.3 summarizes named Segment 2 lentic waters. Alternative 2A: Proposed Action crosses 10 springs that may be affected and Alternative 2B: Southern Route crosses 5 springs that may be affected by construction.

In regards to aquifer sensitivity, Alternative 2A: Proposed Action crosses the least amount of high sensitivity aquifer classification area (15.6 miles or 12.1 percent). Alternative 2B: Southern Route crosses 29.5 miles or 21.7 percent of high sensitivity aquifer along the segment length.

In Segment 3, Alternative 3A: Proposed Action crosses fewer intermittent streams and canals, connectors or artificial paths than Alternative 3C: Lost Creek to Highway 20/26, but crosses more streams than

Alternative 3B: Lost Creek to Lost Cabin. One waterbody crossed by the shared portion of Segment 3 is listed as a CWA 303(d) Impaired Waters by the WDEQ. Alternative 3A: Proposed Action crosses three springs that may be affected, Alternative 3B: Lost Creek to Lost Cabin crosses one spring that may be affected, and Alternative 3C: Lost Creek to Highway 20/26 crosses two springs that may be affected by construction.

In regards to aquifer sensitivity, Alternative 3A: Proposed Action crosses the least amount of high sensitivity aquifer classification area (2 miles or 2.4 percent). Alternative 3B: Lost Creek to Lost Cabin crosses 6.6 miles or 9.0 percent of high sensitivity aquifer along the segment length, and Alternative 3C: Lost Creek to Highway 20/26 crosses 9.8 miles or 9.7 percent of high sensitivity aquifer along the segment length.

Through application of agency-required mitigation measures and procedures described in the POD, the effects on water resources would be minimized to the extent practicable.

4.3.21 Wetlands and Riparian Areas

4.3.21.1 Issues Identified for Analysis

Issues related to wetlands and riparian areas identified in agency and public scoping include:

- Potential impacts on wetlands and riparian areas, particularly from erosion and sedimentation from the construction, operation, and maintenance of the Project
- Potential direct and indirect impacts on vegetation communities
- Potential for dissemination and establishment of noxious weeds and invasive species
- Types of Potential Effects

4.3.21.2 Types of Potential Effects

The design and placement of the Project would avoid wetlands and riparian areas to the extent practicable. In areas where ground disturbance could not be avoided, both direct and indirect effects on wetlands and riparian areas could occur.

The construction of temporary and permanent roads could require crossing wetland and riparian resources. If avoidance or other mitigation strategies were not possible, the temporary removal of riparian vegetation and/or the placement of fill materials (e.g., culverts, rip-rap, wing walls, bridging foundation, etc.) would result in increased sedimentation of wetlands. Modifications to the hydrology, vegetation, or hydric soils or the temporary clearing of riparian vegetation could be required for Project activities related to construction, maintenance, and operations. Project facilities or access roads located near or crossing riparian or wetland resources would be constructed to minimize the design footprint to safely construct the Project while minimizing the effects on wetlands and riparian resources (e.g., hydrology, vegetation, and hydric soils).

If not avoided, short-term, indirect effects on wetlands and riparian areas could include an increased potential for removal of vegetation and an increased discharge leading to an increase in the potential for erosion-caused sedimentation from the disturbance of soils. Also, ground-disturbing activities, such as clearing, grubbing, and blading to remove vegetation, could mobilize fugitive dust and disturb soils within the Project right-of-way, access roads, and facilities, resulting in the discharge of sediment to wetlands and riparian resources. An increase in sedimentation indirectly could degrade the function of wetlands and riparian areas. Clearing of riparian areas would result in indirect effects on the functional capacity of wetlands, including water quality, and an increase in transported sediment to wetlands and other waters. Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.21.3 Criteria for Assessing Impacts

Criteria were developed to assess the intensity of potential effects on wetland and riparian areas associated with implementation of the Project (Table 4-132). The criteria focused on (1) the issues identified for these resources during scoping, (2) the time it would take for those resources to return to preexisting conditions if the resources were affected, and (3) the potential for permanent loss to wetland function and value, including riparian areas. These criteria form the baseline for predicting the level of impacts on wetland and riparian areas.

Table 4-132
Criteria for Assessing Level of Initial Impacts on Wetland and Riparian Resources

Level of Impact	Description
High	▪ Permanent loss of wetlands or water of the U.S. ▪ Permanent loss or conversion of vegetation communities crucial for ecosystem function and biodiversity ▪ Effects on drinking water supply
Moderate	▪ Permanent loss or conversion of uncommon native vegetation communities ▪ Temporary disturbance to rare vegetation communities
Low	▪ Temporary increases in sedimentation to surface water resources ▪ Temporary dredge/fill in waters of the U.S.

4.3.21.4 Mitigation Planning

Initial impacts are those effects resulting from the implementation of the Project, including implementation of design features of the Proposed Action for environmental protection (Table 2-18). Initial impacts were assigned using the criteria presented in Table 4-132. The specific design features of the Proposed Action for environmental protection relevant to wetlands and riparian areas include:

- **Design Feature 10 (soils – erosion control)**. Applied to ensure that permanent erosion-control devices would be installed during Project construction, including waterbars, roadside ditches with subsurface culverts, berms, trash racks on culverts, energy-dissipating structures, mulches, and establishment of permanent vegetation.
- **Design Feature 12 (soils – wet soils during construction)**. Applied to construction activities when soils are wet.
- **Design Feature 13 (vegetation – noxious weeds).** Applied to avoid, reduce, and/or minimize the potential for spread of noxious weeds. These design features are described in Appendix L (Appendix A).
- **Design Feature 14 (vegetation – general maintenance)**. Applied to avoid, reduce, and/or minimize the potential for spread of invasive species. These design features are described in Appendix L of the POD (Appendix A).
- **Design Feature 21 (mitigation measure development)**. Applied to establish mitigation measures, as needed, based on the mutual agreement of Denbury and the BLM, to address changing conditions or requirements within the Project area throughout the operational phase.
- **Design Feature 26 (waste management wastewater)**. Applied to any wastewater generated in association with temporary, portable sanitary facilities and disposed of in accordance with applicable state and local laws and regulations.
- **Design Feature 27 (water – stormwater pollution prevention plan**). Applied to ensure that an SWPPP would be developed, submitted for approval, and followed prior to commencement of construction.

- **Design Feature 28 (water – road drainage).** Applied to ensure that existing drainage systems would not be altered, especially in sensitive areas, such as erodible soils or steep slopes.
- **Design Feature 29 (waters – waterbodies and wetlands)**. Applied to avoid waters of the U.S., including wetlands, to the maximum extent practicable.
- **Design Feature 30 (waters – waterbodies and wetlands [construction])**. Applied to ensure that any construction that is in or adjacent to wetlands and streams would use Applicant-committed BMPs (refer to Applicant-committed environmental protection measures listed to protect surface water quality and to minimize impacts on those resources).
- **Design Feature 31 (water – control of aquatic and invasive species)**. Applied to ensure that all construction equipment that contacts water would be cleaned using high pressure (minimum 3,000 psi) hot water (140 degrees Fahrenheit).

Residual impacts represent anticipated impacts on wetland and riparian areas that would remain after implementation of agency-required mitigation measures (refer to Table 4-2). The level of potential residual impacts on wetland and riparian areas associated with implementation of the Project was assessed using the criteria presented in Table 4-132. The agency-required mitigation measures applied to avoid, reduce, or minimize impacts on wetlands and riparian areas include:

- **Agency-Required Mitigation Measure 1 (sensitive resource avoidance)**. Applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route (micro-site), or apply alternative construction techniques.
- **Agency-Required Mitigation Measure 3 (minimizing or avoiding disturbance to sensitive soils and vegetation)**. Applied in areas where soils and vegetation are particularly sensitive to disturbance. This agency-required mitigation measure would be applied within 500 feet (153 meters) of wetlands and riparian vegetation communities.
- **Agency-Required Mitigation Measure 6 (minimizing tree clearing)**. Applied to minimize the removal of trees in the right-of-way to protect sensitive habitat to the extent practicable. Trees and other vegetation will be removed selectively (e.g., edge feathering) to blend the edge of the right-of-way into adjacent vegetation patterns, as practicable and appropriate. This agency-required mitigation measure would be applied to riparian vegetation communities.
- **Agency-Required Mitigation Measure 8 (interim and intense reclamation).** Applied for intense reclamation (beyond reseeding) to achieve management objectives or prescriptions for riparian areas or wetlands.

Table 4-133 includes types of wetland and riparian resources affected by the implementation of the Project, initial and residual impacts, and the agency-required mitigation measures to be used.

Table 4-133
Summary of Initial and Residual Impacts on Wetland and Riparian Resources

Resource	Initial Impact	Agency-Required Mitigation Measure	Residual Impact
Wetlands			
Palustrine Emergent	High	3, 8	Low
Palustrine Forested/Palustrine Shrub	High	3, 8	Low
Riverine Wetland and Deepwater	High	3, 8	Low
Riparian			
Riparian Areas	High	1, 3, 6, 8	Moderate

NOTE: Initial impacts reflect implementation of the design features of the Proposed Action for environmental protection, which are considered to be part of the Applicant's Project description (and include the Applicant-committed measures [Appendix A]). Residual impacts reflect the anticipated effects that would remain after implementation of agency-required mitigation measures.

4.3.21.5 Results (Direct and Indirect Residual Effects)

Inventory and impact results for wetland resources are displayed on MV-10 and MV-12. Initial impacts for wetland resources would be high, and with application of agency-required mitigation measures, anticipated residual effects would be low. Inventory and impact results for riparian resources are displayed on MV-10.

4.3.21.5.1 Wetlands

Table 4-134 summarizes the total miles of wetland resources crossed by each alternative route. Table 4-134 also provides comparisons of the potential acres of wetland resources affected by each alternative route.

Without mitigation, the types of effects for all alternative routes would include permanent sedimentation and erosion from ground-disturbing activities. However, application of Agency-Required Mitigation Measures 3 and 8 would reduce residual impacts on wetlands to low (refer to Table 4-133), although some temporary disturbance would be anticipated.

No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment would remain as it presently exists.

Table 4-134
Wetland Resources Disturbance

Alternative Route	Total Miles	Wetland Resources Disturbed (acres)								
		Palustrine Emergent			Palustrine Forested/Shrub			Riverine and Deepwater		
		Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]	Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]	Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant										
1A: Proposed Action	30.4	2	0	1	6	0	3	3	0	2
1A Variation: Dry Basin Draw	30.7	2	0	1	6	0	3	3	0	2
1B: Dry Piney	34.5	2	0	1	6	0	3	3	0	2
1C: Figure Four	38.5	10	0	5	1	0	1	2	0	1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect										
2A: Proposed Action	129.1	3	<1	1	3	<1	1	9	<1	4
2B: Southern Route	136.2	9	1	4	0	0	0	6	<1	3
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect										
3A: Proposed Action	83.2	31	1	13	3	0	1	3	0	1
3B: Lost Creek to Lost Cabin	73.0	34	1	14	3	0	1	7	0	3
3C: Lost Creek to Highway 20/26	101.4	34	1	14	3	0	1	3	0	1

SOURCE: Calculations in this table are derived from information provided in the Applicant's Project description.
NOTES:
[1]Temporary disturbance includes estimated area of disturbance associated with the temporary right-of-way, ATWS, and staging areas; temporary disturbance at the Riley Ridge Sweetening Plant, temporary disturbance associated with the H_2S acid gas injection wells and flowlines; and temporary disturbance associated with the 69 kilovolt transmission line.
[2]Permanent disturbance includes estimated area of disturbance associated with pipe yards, access roads outside of the permanent right-of-way, MLVs, pig L/R sites, and the Riley Ridge Sweetening Plant and permanent disturbance associated with the H_2S acid gas injection wells and flowlines, the substation, and the Bairoil Valve Site Interconnect.
[3]Permanent right-of-way reclaimed includes the portion of the permanent right-of-way that will be reclaimed after construction. The disturbance in the permanent right-of-way associated with the pig L/R sites, the Riley Ridge Sweetening Plant, MLVs, and Bairoil valve site are not included.
[4]Disturbance has not been associated with the distribution lines. Additional information has been requested from the Applicant.
[5]Calculations include an additional 5 percent contingency.
Acreages are approximate and have been rounded to the nearest acre.

4.3.21.5.1.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant and Injection Wells

The proposed Riley Ridge Sweetening Plant and injection wells are not located within or adjacent to wetlands. Therefore, no impacts are anticipated from construction or operation of these facilities.

Segment 1 Pipeline Alternative Routes

All alternative routes in Segment 1 cross riverine wetlands and deepwater wetlands, palustrine emergent wetlands, and palustrine forested/shrub wetlands and result in disturbance to all wetland types (refer to Table 4-134). Disturbance to all wetland types would be similar for Alternative 1A: Proposed Action, Alternative 1A Variation: Dry Basin Draw, and Alternative 1B: Dry Piney (refer to Table 4-134). Alternative 1C: Figure Four would result in greater disturbance to palustrine emergent wetlands but less disturbance to palustrine forested/shrub wetlands than the other three alternative routes, resulting in a total amount of disturbance similar to the other three alternative routes.

Based on the impact criteria used in this analysis (refer to Table 4-132), moderate initial impacts on all wetland types would be anticipated, as vegetation clearing, noxious weed invasion, alterations to hydrology, and increased erosion could result in permanent loss or adverse modification of wetlands (refer to Table 4-133). Potential direct and indirect effects of the Project on wetlands are described in greater detail in Section 4.3.21.2. Application of Agency-Required Mitigation Measures 3 and 8, which would avoid or minimize disturbance where possible and intensively reclaim disturbed areas, would be expected to reduce residual impacts to a low level.

4.3.21.5.1.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Both alternative routes in Segment 2 would result in disturbance to palustrine emergent and riverine and deepwater wetlands where alternative routes cross these wetland types (Table 4-134). Alternative 2A: Proposed Action would result in greater disturbance to riverine and deepwater wetlands but less disturbance to palustrine emergent than Alternative 2B: Southern Route. Alternative 2A: Proposed Action would also result in disturbance to palustrine forested/shrub wetlands. Both alternative routes would result in similar total disturbance to wetland resources in Segment 2.

Project impacts on wetland resources, as well as mitigation measures to reduce these impacts, would be similar to those impacts and mitigation measures described for Segment 1.

4.3.21.5.1.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

All alternative routes in Segment 3 would result in disturbance to palustrine emergent wetlands, palustrine forested/shrub wetlands, and riverine and deepwater wetlands where alternative routes cross these wetland resources (Table 4-134). Anticipated disturbance to all wetland types would be similar among all alternative routes, with all alternative routes primarily disturbing palustrine emergent wetlands.

Project impacts on wetland resources, as well as mitigation measures to reduce these impacts, would be similar to those impacts and mitigation measures described for Segment 1.

4.3.21.5.1.4 230-Kilovolt Transmission Line

The construction of a 230kV transmission line to provide power to the proposed Riley Ridge Sweetening Plant is not anticipated to affect wetlands because no NWI wetlands are crossed by the proposed alignment of the transmission line.

4.3.21.5.1.5 Mainline Valve Distribution Lines

As discussed in Section 2.2.1.4, approximately 25 distribution lines will be needed to support the MLV, launchers, and receivers. These distribution lines would be constructed on wooden monopoles (110/220 voltage power), and the towers would be approximately 35 feet high and spaced approximately every 250 feet. The MLV distribution lines would result in temporary and permanent disturbance to wetlands, if

crossed. However, in many cases, access to a power drop would be available within or immediately adjacent to the pipeline right-of-way. If immediate access to a power drop is not available for the MLV, or in sensitive resource areas determined by the BLM, such as wetland areas that could not be avoided or spanned, a solar power nitrogen actuation (via pressurized nitrogen bottles) would be used. If unacceptable impacts on resources from overhead distribution lines could not be avoided during engineering and design of the selected pipeline route, additional NEPA review would be required prior to authorization.

4.3.21.5.2 Riparian Areas

Table 4-135 provides comparisons of the potential acres of riparian areas affected by each alternative route. Table 4-136 summarizes the total miles of riparian areas crossed by each alternative route.

Table 4-135
Riparian Area Inventory Data and Disturbance

Alternative Route	Total Miles	Riparian Areas Disturbed (acres)		
		Temporary Disturbance[1,4,5]	Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant				
1A: Proposed Action	30.4	5	0	3
1A Variation: Dry Basin Draw	30.7	5	0	3
1B: Dry Piney	34.5	7	0	4
1C: Figure Four	38.5	8	0	4
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect				
2A: Proposed Action	129.1	17	1	8
2B: Southern Route	136.2	33	2	15
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect				
3A: Proposed Action	83.2	12	1	5
3B: Lost Creek to Lost Cabin	73.0	8	0	3
3C: Lost Creek to Highway 20/26	101.4	6	0	3

SOURCE: Calculations in this table are derived from information provided in the Applicant's Project description.
NOTES:
[1]Temporary disturbance includes estimated area of disturbance associated with the temporary right-of-way, ATWS, and staging areas; temporary disturbance at the Riley Ridge Sweetening Plant, temporary disturbance associated with the H_2S acid gas injection wells and flowlines; and temporary disturbance associated with the 69kV transmission line.
[2]Permanent disturbance includes estimated area of disturbance associated with pipe yards, access roads outside of the permanent right-of-way, MLVs, pig L/R sites, and the Riley Ridge Sweetening Plant and permanent disturbance associated with the H_2S acid gas injection wells and flowlines, the substation, and the Bairoil Valve Site Interconnect.
[3]Permanent right-of-way reclaimed includes the portion of the permanent right-of-way that will be reclaimed after construction. The disturbance in the permanent right-of-way associated with the pig L/R sites, the Riley Ridge Sweetening Plant, MLVs, and Bairoil valve site are not included.
[4]Disturbance has not been associated with the distribution lines. Additional information has been requested from the Applicant.
[5]Calculations include an additional 5 percent contingency.
Acreages are approximate and have been rounded to the nearest acre.

Table 4-136
Residual Impacts on Riparian Areas

Alternative	Total Miles	Miles of Riparian communities crossed	Residual Impacts (miles)	
			None	Moderate
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant				
1A: Proposed Action	30.4	0.4	30.0	0.4
1A Variation: Dry Basin Draw	30.7	0.4	30.3	0.4
1B: Dry Piney	34.5	0.6	33.9	0.6
1C: Figure Four	38.5	0.7	37.8	0.7
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect				
2A: Proposed Action	129.1	1.2	127.9	1.2
2B: Southern Route	136.2	2.3	133.9	2.3
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect				
3A: Proposed Action	83.2	0.8	82.4	0.8
3B: Lost Creek to Lost Cabin	73.0	0.5	72.5	0.5
3C: Lost Creek to Highway 20/26	101.4	0.4	101.0	0.4

4.3.21.5.2.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.21.5.2.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant and Injection Wells

The proposed Riley Ridge Sweetening Plant and injection wells are not located within or adjacent to riparian areas. Therefore, no impacts are anticipated from construction or operation of these facilities.

Segment 1 Pipeline Alternative Routes

Based on the impact criteria used in this analysis (refer to Table 4-132), moderate residual impacts are anticipated where alternative routes cross riparian areas (refer to Table 4-136), as vegetation clearing and noxious weed invasion could result in permanent loss or alteration. Potential direct and indirect effects of the Project on riparian areas are described in greater detail in Section 4.3.21.2. Application of Agency-Required Mitigation Measures 1, 3, 6, and 8, which aim to avoid or minimize disturbance where possible, limit vegetation removal, and reclaim disturbed areas, is expected to reduce residual impacts to a moderate level.

Of the three alternative routes in Segment 1, Alternative 1C: Figure Four would result in the greatest amount of residual impacts on riparian areas (refer to Table 4-136). However, the amount of residual impacts on riparian areas differs little among the three alternative routes with Alternative 1C: Figure Four resulting in from 0.1 to 0.3 more miles of residual impacts than the other alternative routes.

4.3.21.5.2.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Both alternative routes are expected to result in disturbance to riparian areas, with Alternative 2B: Southern Route resulting in almost twice the amount of disturbance than Alternative 2A: Proposed Action

(refer to Table 4-135). Project impacts on riparian areas, as well as mitigation measures to reduce these impacts, would be similar to those impacts and mitigation measures described for Segment 1.

4.3.21.5.2.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Of the three alternative routes in Segment 3, Alternative 3A: Proposed Action would result in a greater amount of moderate residual impacts, as it crosses more riparian areas than either of the other alternative routes (refer to Table 4-136). However, the amount of residual impacts on riparian areas differs little between the three alternative routes, with Alternative 3A: Proposed Action resulting in only 0.4 more miles of residual impacts than the least impactful alternative, Alternative 3C: Lost Creek to Highway 20/26.

Project impacts on riparian areas, as well as mitigation measures to reduce these impacts, would be similar to those impacts and mitigation measures described for Segment 1.

4.3.21.5.2.5 230-Kilovolt Transmission Line

The construction of a 230kV transmission line to provide power to the proposed Riley Ridge Sweetening Plant would not affect riparian areas, as no riparian areas are crossed by the proposed alignment of the transmission line.

4.3.21.5.2.6 Mainline Valve Distribution Lines

The MLV distribution lines would result in temporary and permanent disturbance to riparian areas, if crossed. However, in many cases, access to a power drop would be available within or immediately adjacent to the pipeline right-of-way. If immediate access to a power drop is not available for the MLV, or in sensitive resource areas determined by the BLM, such as riparian areas, a solar power nitrogen actuation (via pressurized nitrogen bottles) would be used. If unacceptable impacts on resources from overhead distribution lines could not be avoided during engineering and design of the selected pipeline route, additional NEPA review would be required prior to authorization.

4.3.21.6 Summary Comparison of Alternative Routes

4.3.21.6.1.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

In Segment 1, all alternative routes would result in temporary disturbance to wetlands and riparian areas where the Green River would be crossed. Alternative 1B: Dry Piney and Alternative 1C: Figure Four have the potential to result in greater disturbance, as the alternative routes cross Dry Piney Creek and Figure Four Canyon, respectively. However, through the application of agency-required mitigation measures, including avoidance through HDD, measures to control the spread of noxious weeds and limit sedimentation, and minimization of disturbance to vegetation and intensive reclamation efforts, impacts on wetland and riparian areas would be minimized to the extent practicable.

4.3.21.6.1.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

In Segment 2, both alternative routes would result in temporary and permanent disturbance to wetlands and riparian areas, with Alternative 2B: Southern Route resulting in greater disturbance to wetlands but slightly less disturbance to riparian areas than Alternative 2A: Proposed Action. However, through the application of agency-required mitigation measures, including avoidance through HDD, measures to control the spread of noxious weeds and limit sedimentation, and minimization of disturbance to

vegetation and intensive reclamation efforts, impacts on wetlands and riparian areas would be minimized to the extent practicable.

4.3.21.6.1.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

In Segment 3, all alternative routes would result in temporary disturbance to riparian areas, as well as both temporary and permanent disturbance to wetlands at several locations. Alternative 3A: Proposed Action would result in the least amount of temporary and permanent disturbance to wetlands and riparian areas. However, through the application of agency-required mitigation measures, including avoidance through HDD, measures to control the spread of noxious weeds and limit sedimentation, and minimization of disturbance to vegetation and intensive reclamation efforts, impacts on wetlands and riparian areas would be minimized to the extent practicable.

4.3.22 Wild Horses and Burros

4.3.22.1 Issues Identified for Analysis

Issues identified for analysis during the scoping process include:

- Potential direct and indirect effects on wild horses and burros during the construction, operation, and maintenance phases of the Project
- Direct effects on HMAs, including interference with wild horse management, wild horse displacement, potential spread of noxious and invasive weeds, increased mortality of wild horses from increased traffic, and impacts on active foaling areas

4.3.22.2 Types of Potential Effects

Potential effects from the Project construction, maintenance, and infrastructure on wild horses and burros and their habitats include:

- Permanent or temporary loss of seasonal or year-round habitat
- Displacement of wild horses
- Increased mortality of wild horses from increased traffic
- Interference with wild horse management
- Impacts on active foaling areas
- Spread of noxious and invasive weeds from ground-clearing and construction activities

Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.22.3 Assessment of Impacts

A discussion of the number of miles where the Project alternative routes cross HMAs is presented followed by a qualitative discussion (referencing high, moderate, and low impacts) of how this crossing may affect the herd management prescriptions.

4.3.22.4 Mitigation Planning

Applicant-committed design features and mitigation measures were developed to avoid, reduce, and mitigate effects of the Project. However, agency-required mitigation measures were applied specific to the resources being protected within the HMA (i.e., vegetation, soil resources, etc.) instead of by the HMA boundary. By applying agency-required mitigation measures by resources instead of by HMA boundary, it is less likely that the implementation of agency-required mitigation measures will be overestimated/overstated in the EIS (i.e., applied where an alternative route crosses HMA versus only

where a particular resource is within an area). HMA management prescriptions will be honored and agency-required mitigation measures will be applied where possible to reduce any effects on these managed areas. Refer to the applicable resource section being protected by HMA for agency-required mitigation information.

4.3.22.5 Results (Direct and Indirect Residual Effects)

Inventory and impact results for this section are displayed in Table 4-137, Map 4-3, and on MV-7.

Table 4-137
Wild Horse Management Areas Inventory Data

Alternative	Total Miles	Wild Horse Management Area (miles)
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant		
1A: Proposed Action	30.4	8.0
1A: Variation Dry Basin Draw	30.7	8.0
1B: Dry Piney	34.5	8.0
1C: Figure Four	38.5	9.5
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect		
2A: Proposed Action	129.1	68.7
2B: Southern Route	136.2	88.5
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect		
3A: Proposed Action	83.2	14.6
3B: Lost Creek to Lost Cabin	73.0	14.6
3C: Lost Creek to Highway 20/26	101.4	14.6

4.3.22.5.1.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment would remain as it presently exists.

4.3.22.5.1.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction

Impacts associated with the development of the Riley Ridge Sweetening Plant would differ from those associated with the pipeline and transmission line rights-of-way because forage vegetation and disturbed acreage would not re-establish and become available to wild horses until the proposed Project is decommissioned and final reclamation has occurred. Appendix A Resource Report 4 of the preliminary POD [note: the preliminary POD is included as Appendix A of this EIS]). details the proposed project components and their associated construction and operational impacts on wild horses and HMAs. The total permanent disturbance would be approximately 13 acres. This would not result in a change to the AML due to the fact that this reduction in acreage is much less than 1 percent of the total acreage for the entire HMA.

Injection Wells

The proposed injection wells are not located within an HMA. Therefore, no impacts are anticipated from construction or operation of these facilities.

Segment 1 Pipeline Alternative Routes

Impacts on HMAs for Alternative 1A: Proposed Action and all alternative routes in Segment 1 are anticipated to be low. Possible short-term effects from the construction of the Project include a temporary

reduction in AUMs due to vegetation/ground-clearing activities and displacement of wild horses due to construction-related disturbances (noise, vehicles/equipment, and personnel) associated with development of access roads, site grading, and building of infrastructure. Wild horses and burros can move efficiently and movement will not likely be limited by the trench. Dirt escapement ramps would be used in the trench to aid an animal if it were to fall in. Increased construction traffic could increase the potential of collisions or mortalities. Larger footprints of disturbance before reclamation activities would decrease the total amount of acreage available for wild horses. Possible long-term effects would be the reduced availability of wild horse habitat where permanent disturbance/structures would occur from the Project. Successful reclamation could lead to an abundance of vegetative resources on reclaimed sites, especially in the Closed Divide Basin. Refer to Table 4-137 for HMA mileage crossed by the Project. Specific HMAs that would be affected by the construction of the Project in Segment 1 are listed in Appendix F.

Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Impacts on wild horses and burros for Alternatives 2A: Proposed Action and 2B: Southern Route are anticipated to be similar to the impacts described for the alternative routes in Segment 1. Refer to Table 4-30 for HMA mileage crossed by the Project. Specific HMAs that would be affected by the Project in Segment 2 are listed in Appendix F.

Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Impacts on wild horses and burros for Alternative 3A: Proposed Action and all alternative routes in Segment 3 are anticipated to be similar to the impacts described for the alternative routes in Segment 1. Refer to Table 4-30 for HMA mileage crossed by the Project. Specific HMAs that would be affected by the Project in Segment 3 are listed in Appendix F.

230-Kilovolt Transmission Line

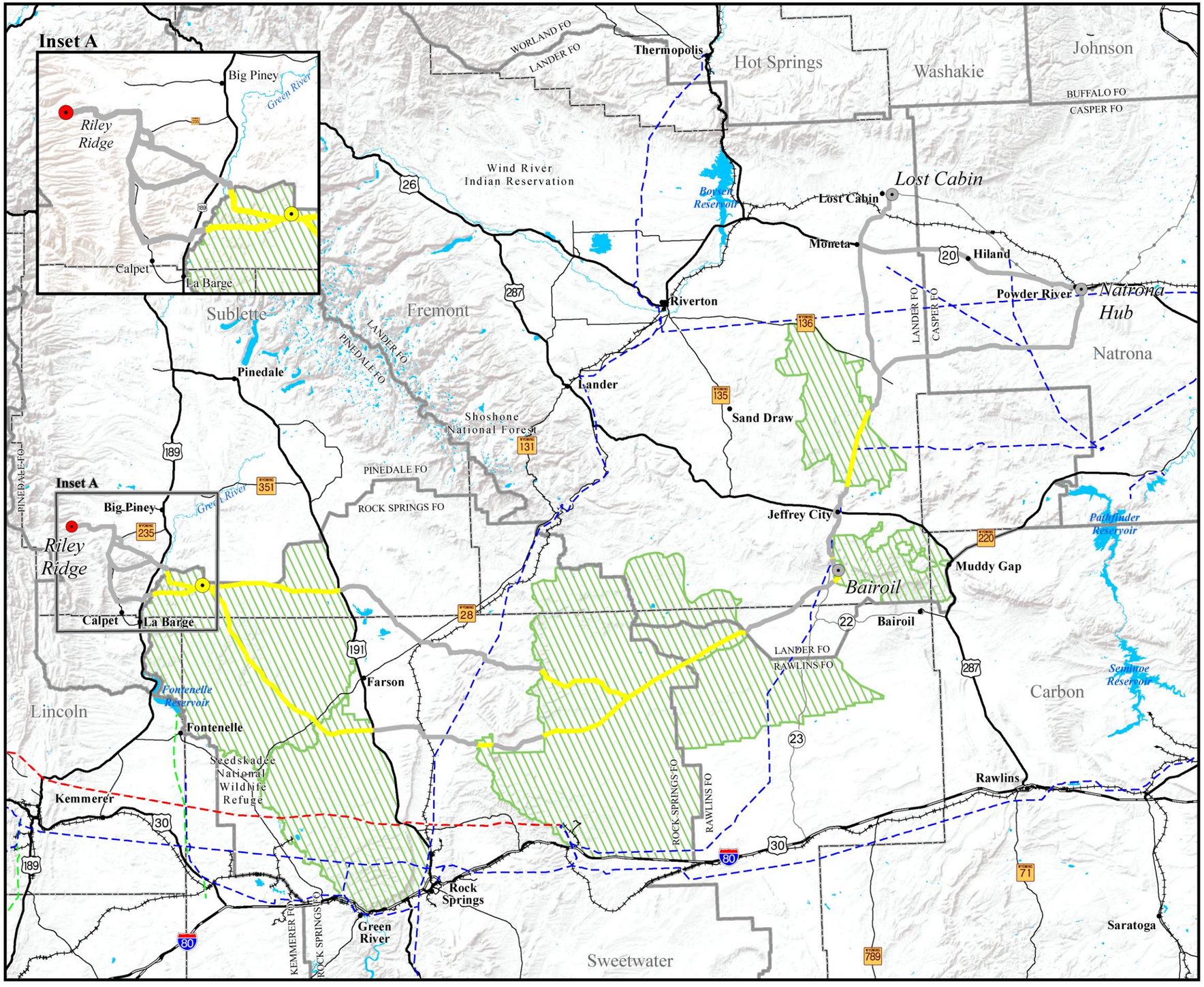
Types of potential environmental effects on wild horses and burros grazing and operations from the construction, operation, and maintenance of the Project would be both direct and indirect. These effects include:

- Temporary reduction of forage availability in HMAs associated with pulling and tensioning sites, staging areas, access roads, and tower sites (short- and long-term effects)
- Potential spread of noxious and invasive species on HMAs, interference with wild horse and burro management, interference with access to operations, and mortality of wild horses and burros from increased traffic short-term effects)

Mainline Valve Distribution Lines

The MLV distribution lines are expected to result in temporary and permanent disturbance to soils and vegetation communities associated with HMAs. Though not anticipated, the MLV distribution lines could also potentially affect or conflict with foaling areas and wild horse management operations. Without knowing the final location of the distribution lines, the amount of disturbance to HMAs resulting from the construction of the distribution lines cannot be provided at this time. Refer to Section 2.2.1.4 for more detail.

Application of design features and agency-required mitigation measures to reduce impacts associated with construction of the distribution lines would be consistent with the rest of the Project. In addition, where the MLV distribution lines would affect or conflict with foaling areas or wild horse management operations, the distribution lines could be buried and the MLV may instead be powered through an on-site solar power system, which would effectively limit the amount of expected disturbance.



Map 4-3
Herd Management Areas

RILEY RIDGE TO NATRONA PROJECT

Wild Horse Herd Management Areas

- Wild Horse Herd Management Area

Alternative Routes

- Area Crossed by Project
- Area Not Crossed by Project

Project Features

- Riley Ridge Treatment Plant
- Proposed Riley Ridge Sweetening Plant
- Interconnect

General Reference

- City or Town
- 345kV Transmission Line
- 230kV Transmission Line
- 138kV Transmission Line
- Greencore Pipeline
- Railroad
- Interstate Highway
- U.S. Highway
- State Highway
- Other Road
- Lake or Reservoir
- County Boundary
- BLM Field Office Boundary

SOURCES:
Wild Horse Management Areas, BLM 2010, 2015;
BLM Field Office Boundary, BLM 2008;
Transmission Lines and Substations as digitized by EPG, POWERmap Platts 2009;
Highways, Roads, and Railroads, ESRI 2013; Greencore Pipeline, SWCA 2015;
Water Features, ESRI 2008, USGS 2010; State and County Boundaries, ESRI 2013

Last Revised: February 19, 2015
Draft EIS: March 2018

0 5 10 20
Miles

THIS PAGE INTENTIONALLY LEFT BLANK

4.3.22.6 Summary Comparison of Alternative Routes

Impacts on HMAs for all segments, routes, and alternative routes would be similar. Impacts on HMAs include a temporary reduction of forage availability in grazing allotments, displacement from construction-related disturbances (noise, vehicles/equipment, and personnel), mortalities from increased traffic, and overall reduction of available acreage from permanent Project infrastructure. However, Applicant-committed design features, including agency-required mitigation measures, and vegetation reclamation would be applied to reduce overall impacts on HMAs and wild horses and burros. In Segment 1, Alternative 1A: Proposed Action, Alternative 1A: Variation Dry Basin Draw, and Alternative 1B: Dry Piney all cross 8 miles of HMAs. Alternative 1C: Figure Four crosses 9 miles. In Segment 2, Alternative 2A: Proposed Action crosses 68.7 miles and Alternative 2B: Southern Route crosses 88.5 miles of HMAs. In Segment 3, all alternative routes cross 14.6 miles of HMAs.

4.3.23 Wildlife

This section addresses terrestrial wildlife species and habitats, including special status species and their habitats, which may be affected by the Project. Wildlife management areas are discussed in Section 4.3.16. Fish and aquatic species are addressed in Section 4.3.3.

4.3.23.1 Issues Identified for Analysis

Issues related to wildlife that were identified in agency and public scoping, and in the corresponding regulatory requirements, include:

- The protection and conservation of, and potential effects on, species and their critical habitat listed under the ESA, including the yellow-billed cuckoo
- Potential effects on BLM sensitive species
- Potential effects on greater sage-grouse and compliance with the BLM ARMPAs
- Potential effects on species protected by the MBTA
- Potential effects on species protected by the BGEPA
- Potential effects on important big game habitats, including:
    - Crucial seasonal ranges and parturition areas
    - Migration routes
    - Herd Areas/herd units

4.3.23.2 Types of Potential Effects

Without mitigation, the Project would result in direct and indirect effects on wildlife and their habitats. In general, potential direct and indirect effects include:

- Permanent and temporary habitat loss
- Habitat fragmentation
- Effects on habitat use through behavioral modifications resulting in habitat use displacement, including disruption of reproduction, foraging, and predation
- Migration disruption and obstruction

Refer to Sections 4.2.1.1, 4.2.1.2, and 4.2.1.3 for further detail regarding the methodology used to conduct impact assessment, mitigation planning, and identification of residual impacts.

4.3.23.3 Criteria for Assessing Impacts

The criteria for assessing impacts on wildlife resources are shown in Table 4-138.

Table 4-138
Criteria for Assessing Level of Impacts on Wildlife

Level of Impacts	Description
High	▪ Permanent disruption of seasonal wildlife migration patterns[1] ▪ Permanent habitat loss and fragmentation ▪ Ongoing mortality of wildlife due to direct interaction with the Project that may result in population-level effects ▪ Impacts on designated seasonal use or key habitat sensitive areas (i.e., active nesting, fawning, leks) ▪ Long-term disruption or displacement of wildlife from sensitive, critical, and special habitats (including greater sage-grouse) during sensitive periods resulting from noise and human presence (e.g., continuous construction activities) ▪ Within designated NSO buffer distances for eagles and other regulated/managed species (i.e., less than 0.5 mile of active eagle nest) ▪ Loss or disturbance of sensitive, critical, or special wildlife habitats if disturbance is outside sensitive temporal periods
Moderate	▪ Temporary disturbance or creation of temporary barriers to movement in wildlife migration routes ▪ Temporary habitat loss and fragmentation of high quality habitat ▪ Incidental mortality of wildlife due to direct interaction with the Project that does not result in population-level effects ▪ Temporary, short-term disturbance or displacement of wildlife from core/priority, crucial, critical, or severe habitats (including greater sage-grouse) during sensitive periods resulting from minor or brief periods of noise and human presence (e.g., minor use of access roads with passenger vehicles, survey, or staking operations) ▪ Loss or adverse modification of unoccupied suitable habitat
Low	▪ Disturbance in migration routes that does not create a physical barrier and is outside sensitive periods ▪ Temporary habitat loss and fragmentation of moderate to low quality habitat ▪ Impacts that would have only minor adverse effects on species and would not limit the long-term sustainability of populations (e.g., indirect effects or impacts in areas of preexisting disturbance) ▪ Indirect effects or disturbance in areas of preexisting disturbance

NOTE: [1]As determined by the WGFD

4.3.23.4 Mitigation Planning

Initial impacts are those effects resulting from the implementation of the Project, including implementation of design features of the Proposed Action for environmental protection (Table 2-18). Initial impacts were assigned using the criteria presented in Table 4-138. The specific design features of the Proposed Action for environmental protection relevant to wildlife resources include:

- **Design Feature 1 (preconstruciton surveys for sensitive species).** Applied to ensure that field surveys are complete prior to construction to determine presence/absence and/or extent of habitat for subject species.
- **Design Feature 2 (wildlife and livestock – disturbance and harassment).** Applied to ensure that all employees, contractors, and site visitors would be instructed to avoid harassment and disturbance of wildlife, especially during reproductive seasons.
- **Design Feature 3 (wildlife and livestock – vehicle collisions).** Applied to ensure that personnel and contractors adhere to a 35-mph speed limit in the Project area to ensure safe and efficient traffic flow and to reduce wildlife collisions, disturbance, noise, and airborne dust.

Residual impacts represent anticipated impacts on wildlife resources that would remain after implementation of agency-required mitigation measures (refer to Table 4-2). The level of potential residual impacts on wildlife resources associated with implementation of the Project was assessed using the criteria presented in Table 4-138. The agency-required mitigation measures applied to avoid, reduce, or minimize impacts on wildlife resources include:

- **Agency-Required Mitigation Measure 1 (sensitive resource avoidance).** Applied to reduce the width of the right-of-way; adjust the alignment of the pipeline route (micro-site); or apply alternative construction techniques. Resource avoidance is a condition of POD approval for several resources, including greater sage-grouse leks.
- **Agency-Required Mitigation Measure 3 (minimizing or avoiding disturbance to sensitive soils or vegetation).** Applied to areas with sensitive vegetation.
- **Agency-Required Mitigation Measure 6 (minimizing tree clearing).** Applied to minimize the removal of trees in the right-of-way to protect sensitive habitat to the extent practicable. Trees and other vegetation will be removed selectively (e.g., edge feathering) to blend the edge of the right-of-way into adjacent vegetation patterns, as practicable and appropriate. This agency-required mitigation measure would be applied to riparian vegetation communities.
- **Agency-Required Mitigation Measure 7 (seasonal restrictions).** Applied as a condition of POD approval to avoid surface-disturbing or disrupting activities associated with construction, operation, and maintenance of the Project during sensitive periods for wildlife and plants.
- **Agency-Required Mitigation Measure 8 (interim and intense reclamation).** Applied where re-establishment of vegetation has been shown or is expected to be difficult and intense reclamation would be required (typically) for locations where higher impacts on habitats have been identified.
- **Agency-Required Mitigation Measure 10 (limit accessibility in sensitive habitats).** Applied to gate or otherwise block sensitive habitats in cooperation with the appropriate land-management agencies to limit public access.

The BLM-required mitigation measures are all based on regulatory related mitigation defined by the USFWS, BLM, and WGFD and Applicant design responses to these requirements. Table 4-139 summarizes the specific Agency-Required Mitigation Measure 7 seasonal restrictions that are applicable to the wildlife resources included in the analysis.

In addition, all blasting work would be conducted in compliance with federal, state, and local laws, rules, and regulations. The Contractor is responsible for obtaining permits to store blasting materials. Blasting will not occur without BLM approval regarding sensitive wildlife areas. Procedures and materials used would be identified in the blasting plan provided by the blasting contractor.

Reasonably foreseeable residual effects on resources that are expected to remain after the application of mitigation measures and that would inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies may warrant additional appropriate mitigation (refer to Section 4.5). Following the assessment in this section of the potential impacts that could remain after application of the avoidance, minimization, and rectification/restoration measures included in the Project mitigation strategy, the BLM determined the remaining residual impact on greater sage-grouse, specifically temporary habitat loss, meets the criteria presented previously in this section and warrant additional appropriate mitigation. Refer to Section 4.5.

THIS PAGE INTENTIONALLY LEFT BLANK

Table 4-139
Spatial and Seasonal Restrictions on Wildlife

Rock Springs BLM Field Office[1,2]		Casper BLM Field Office[1,2]		Lander BLM Field Office[1,2]		Pinedale BLM Field Office[1,2]		Rawlins BLM Field Office[1,2]	
Area to Which Restriction Applies	**Restriction**	**Area to Which Restriction Applies**	**Restriction**	**Area to Which Restriction Applies**	**Restriction**	**Area to Which Restriction Applies**	**Restriction**	**Area to Which Restriction Applies**	**Restriction**
Mammal Species									
Canada Lynx									
Federally listed and proposed threatened and endangered species' habitat	BLM will consult or conference (for proposed species) with USFWS to determine whether its actions may affect any listed or proposed species and to document its determinations in a BA	Designated critical habitat for threatened or endangered species	NSO or use is allowed	Lynx habitat	If activities are proposed in lynx habitat, BLM shall ensure that stipulations and conditions of approval for limitations on the timing of activities and surface use and occupancy are developed at the leasing and Notice of Staking/ Application for Permit to Drill stages	Lynx habitat	If activities are proposed in lynx habitat, BLM shall ensure that stipulations and conditions of approval for limitations on the timing of activities and surface use and occupancy are developed at the leasing and Notice of Staking/Application for Permit to Drill stages	Lynx habitat	If activities are proposed in lynx habitat, BLM shall ensure that stipulations and conditions of approval for limitations on the timing of activities and surface use and occupancy are developed at the leasing and Notice of Staking/Application for Permit to Drill stages
Wyoming Pocket Gopher									
Determined on case-by-case basis	Determined on case-by-case basis	–	Not known to occur on Casper Field Office	–	Not known to occur on Lander Field Office	–	Not known to occur on Pinedale Field Office	Determined on case-by-case basis	Determined on case-by-case basis
White-Tailed Prairie Dog									
Determined on case-by-case basis	Determined on case-by-case basis	Prairie dog towns	Surface-disturbing and disruptive activities should be designed in a manner that avoids prairie dog towns and complexes (controlled surface use); where this is impractical, the disturbance should be located in a manner where it will have the least amount of impact on prairie dogs	Occupied colonies	Avoid surface-disturbing activities within colonies where possible	Prairie dog towns greater than 12.5 acres (in the oil and gas Traditional Leasing and Unavailable Areas)	Surface-disturbing activities will be avoided	Prairie dog towns	Surface-disturbing and disruptive activities will be avoided
–	–	–	–	–	–	Within 50 feet of burrows (in the oil and gas Traditional Leasing and Unavailable Areas)	Identification of burrows through surveys require avoidance	–	–
Pygmy Rabbit									
Determined on case-by-case basis	Determined on case-by-case basis	–	Not known to occur on Casper Field Office	Within 200 feet of occupied pygmy rabbit habitat	NSO or use	Within 50 feet of burrows (in the oil and gas Traditional Leasing and Unavailable Areas)	Identification of burrows through surveys require avoidance	Determined on case-by-case basis	Determined on case-by-case basis
Fringed Myotis									
Determined on case-by-case basis	Determined on case-by-case basis	Determined on case-by-case basis	Determined on case-by-case basis	–	Not known to occur on Lander Field Office	–	Not known to occur on Pinedale Field Office	Determined on case-by-case basis	Determined on case-by-case basis
Long Eared Myotis									
Determined on case-by-case basis	Determined on case-by-case basis	Determined on case-by-case basis	Determined on case-by-case basis	Within 0.25 mile of bat maternity roosts and hibernation sites	NSO or use	Determined on case-by-case basis	Determined on case-by-case basis	Determined on case-by-case basis	Determined on case-by-case basis
Townsend's Big Eared Bat									
Determined on case-by-case basis	Determined on case-by-case basis	Determined on case-by-case basis	Determined on case-by-case basis	Within 0.25 mile of bat maternity roosts and hibernation sites	NSO or use	–	Not known to occur on Pinedale Field Office	Determined on case-by-case basis	Determined on case-by-case basis
Migratory Birds									
–	–	–	–	–	–	–	–	Migratory bird nesting habitat	Restricted from April 10 to July 10

Table 4-139
Spatial and Seasonal Restrictions on Wildlife

Rock Springs BLM Field Office[1,2]		Casper BLM Field Office[1,2]		Lander BLM Field Office[1,2]		Pinedale BLM Field Office[1,2]		Rawlins BLM Field Office[1,2]	
Area to Which Restriction Applies	**Restriction**	**Area to Which Restriction Applies**	**Restriction**	**Area to Which Restriction Applies**	**Restriction**	**Area to Which Restriction Applies**	**Restriction**	**Area to Which Restriction Applies**	**Restriction**
Yellow-Billed Cuckoo									
Federally listed and proposed threatened and endangered species' habitat	BLM will consult or conference (for proposed species) with USFWS to determine whether its actions may affect any listed or proposed species and to document its determinations in a BA	Designated critical habitat for threatened or endangered species	NSO or use is allowed	Federally threatened and endangered species' habitat	Develop and implement protective measures for federally listed species in coordination with the USFWS; develop site-specific measures for BLM-authorized activities to protect threatened and endangered species	Within 500 feet of perennial waters and wetland/riparian areas	Surface-disturbing activities would be avoided	Within 0.5 mile of identified habitat	Surface-disturbing and disruptive activities are prohibited from April 15 to August 15
–	–	–	–	–	–	Within 0.5 mile of identified habitat	Surface-disturbing and disruptive activities are prohibited from April 15 to August 15	Within 500 feet of perennial waters and wetland/riparian areas	Surface-disturbing activities would be avoided
Mountain Plover									
Within 0.25 mile of active mountain plover nesting aggregation areas	Avoidance for surface-disturbing and disruptive activities from April 10 to July 10	Determined on case-by-case basis	Determined on case-by-case basis	Within 0.25 mile of identified habitat	Surface-disturbing and disruptive activities are restricted or prohibited from April 10 to July 10	Determined on case-by-case basis (in the oil and gas Traditional Leasing and Unavailable Areas)	All surface-disturbing activities are restricted April 10 to July 10	Potential and occupied habitat	Surface-disturbing and disruptive activities are prohibited from April 10 to July 10
Loggerhead Shrike, Long Billed Curlew, Brewer's Sparrow, Sage Sparrow, Sage Thrasher									
Determined on case-by-case basis	Determined on case-by-case basis	Determined on case-by-case basis	Determined on case-by-case basis	Determined on case-by-case basis	Determined on case-by-case basis	Determined on case-by-case basis	Determined on case-by-case basis	Determined on case-by-case basis	Determined on case-by-case basis
Greater Sage-Grouse[3]									
On or within a 0.6-mile radius of the perimeter of occupied leks inside PHMAs	Surface occupancy and surface-disturbing activities will be prohibited	On or within a 0.6-mile radius of the perimeter of occupied leks inside PHMAs	Surface occupancy and surface-disturbing activities will be prohibited	On or within a 0.6-mile radius of the perimeter of occupied leks inside PHMAs	Surface occupancy and surface-disturbing activities will be prohibited	On or within a 0.6-mile radius of the perimeter of occupied leks inside PHMAs	Surface occupancy and surface-disturbing activities will be prohibited	On or within a 0.6-mile radius of the perimeter of occupied leks inside PHMAs	Surface occupancy and surface-disturbing activities will be prohibited
On or within a 0.25-mile radius of the perimeter of occupied leks outside PHMAs	Surface occupancy and surface-disturbing activities will be prohibited	On or within a 0.25-mile radius of the perimeter of occupied leks outside PHMAs	Surface occupancy and surface-disturbing activities will be prohibited	On or within a 0.25-mile radius of the perimeter of occupied leks outside PHMAs	Surface occupancy and surface-disturbing activities will be prohibited	On or within a 0.25-mile radius of the perimeter of occupied leks outside PHMAs	Surface occupancy and surface-disturbing activities will be prohibited	On or within a 0.25-mile radius of the perimeter of occupied leks outside PHMAs	Surface occupancy and surface-disturbing activities will be prohibited
Winter concentration areas	Surface-disturbing and/or disruptive activities would be prohibited from December 1 to March 14	Winter concentration areas	Surface-disturbing and/or disruptive activities would be prohibited from December 1 to March 14	Winter concentration areas	Surface-disturbing and/or disruptive activities would be prohibited from December 1 to March 14	Winter concentration areas	Surface-disturbing and/or disruptive activities would be prohibited from December 1 to March 14	Winter concentration areas	Surface-disturbing and/or disruptive activities would be prohibited from December 1 to March 14
Breeding, nesting and early brood-rearing habitat inside PHMAs (core only)	Surface-disturbing and/or disruptive activities would be prohibited from March 15 to June 30	Breeding, nesting and early brood-rearing habitat inside PHMAs (core only)	Surface-disturbing and/or disruptive activities would be prohibited from March 15 to June 30	Breeding, nesting and early brood-rearing habitat inside PHMAs (core only)	Surface-disturbing and/or disruptive activities would be prohibited from March 15 to June 30	Breeding, nesting and early brood-rearing habitat inside PHMAs (core only)	Surface-disturbing and/or disruptive activities would be prohibited from March 15 to June 30	Breeding, nesting and early brood-rearing habitat inside PHMAs (core only)	Surface-disturbing and/or disruptive activities would be prohibited from March 15 to June 30
Breeding, nesting and early brood-rearing habitat inside PHMAs (connectivity only) within 4 miles of the lek or lek perimeter of any occupied lek	Surface-disturbing and/or disruptive activities would be prohibited from March 15 to June 30	Breeding, nesting and early brood-rearing habitat inside PHMAs (connectivity only) within 4 miles of the lek or lek perimeter of any occupied lek	Surface-disturbing and/or disruptive activities would be prohibited from March 15 to June 30	Breeding, nesting and early brood-rearing habitat inside PHMAs (connectivity only) within 4 miles of the lek or lek perimeter of any occupied lek	Surface-disturbing and/or disruptive activities would be prohibited from March 15 to June 30	Breeding, nesting and early brood-rearing habitat inside PHMAs (connectivity only) within 4 miles of the lek or lek perimeter of any occupied lek	Surface-disturbing and/or disruptive activities would be prohibited from March 15 to June 30	Breeding, nesting and early brood-rearing habitat inside PHMAs (connectivity only) within 4 miles of the lek or lek perimeter of any occupied lek	Surface-disturbing and/or disruptive activities would be prohibited from March 15 to June 30
Breeding, nesting and early brood-rearing habitat outside PHMAs within 2 miles of the lek or lek perimeter of any occupied lek	Surface-disturbing and/or disruptive activities would be prohibited from March 15 to June 30	Breeding, nesting and early brood-rearing habitat outside PHMAs within 2 miles of the lek or lek perimeter of any occupied lek	Surface-disturbing and/or disruptive activities would be prohibited from March 15 to June 30	Breeding, nesting and early brood-rearing habitat outside PHMAs within 2.0 miles of the lek or lek perimeter of any occupied lek	Surface-disturbing and/or disruptive activities would be prohibited from March 15 to June 30	Breeding, nesting and early brood-rearing habitat outside PHMAs within 2.0 miles of the lek or lek perimeter of any occupied lek	Surface-disturbing and/or disruptive activities would be prohibited from March 15 to June 30	Breeding, nesting and early brood-rearing habitat outside PHMAs within 2.0 miles of the lek or lek perimeter of any occupied lek	Surface-disturbing and/or disruptive activities would be prohibited from March 15 to June 30

Table 4-139
Spatial and Seasonal Restrictions on Wildlife

Rock Springs BLM Field Office[1,2]		Casper BLM Field Office[1,2]		Lander BLM Field Office[1,2]		Pinedale BLM Field Office[1,2]		Rawlins BLM Field Office[1,2]	
Area to Which Restriction Applies	**Restriction**	**Area to Which Restriction Applies**	**Restriction**	**Area to Which Restriction Applies**	**Restriction**	**Area to Which Restriction Applies**	**Restriction**	**Area to Which Restriction Applies**	**Restriction**
Raptor Species									
Bald Eagle									
Within 1-mile radius of nests	All surface-disturbing activities are restricted from February 1 to July 31	Within 0.5 to 1.0 mile of nests	Prohibit surface development on public lands; the specific distance and dimensions of the area on which surface development will be prohibited will be determined on a case-by-case basis after consultation with the USFWS	Within 1.0 mile of nests	Surface-disturbing and disruptive activities are restricted or prohibited from February 1 to August 15	Within 0.5 mile of nests	Minimal human activity levels are allowed during the period of first occupancy to 2 weeks after fledging from February 1 to August 15[4]	Within 0.5 mile of nests	Minimal human activity levels are allowed during the period of first occupancy to 2 weeks after fledging from February 1 to August 15[4]
Winter concentration areas	Avoidance from November 15 to April 30	Within 0.5 mile of nests	Avoid surface disturbance or occupancy from February 1 to July 31, or until young birds have fledged	–	–	Area within 0.5 to 1.0 mile from nests	Light human activity levels should not be exceeded during the nesting season (February 1 to August 15); moderate levels should not be exceeded during other times of the year[4]	Area within 0.5 to 1.0 mile from nests	Light human activity levels should not be exceeded during the nesting season (February 1 to August 15); moderate levels should not be exceeded during other times of the year[4]
–	–	–	–	–	–	2.5 miles extending in all directions from the nest or 0.5 mile from the bank of all streams within 2.5 miles of the nest	Human activity levels should not exceed moderate[4]	2.5 miles extending in all directions from the nest or 0.5 mile from the bank of all streams within 2.5 miles of the nest	Human activity levels should not exceed moderate[4]
–	–	–	–	–	–	Within 1-mile radius of nests	All surface-disturbing activities are restricted February 1 to August 15	Within 1.0 mile of nests	Surface-disturbing and disruptive activities are prohibited from February 1 to July 15
–	–	–	–	–	–	Within 1.0 mile of active roost sites	No ground-disturbing activities will be permitted year round	Within 2.0 miles of communal roosts	Surface-disturbing or other disruptive activities will be prohibited from February 1 to August 15
–	–	–	–	–	–	Within 0.5-mile radius of winter roost areas	All surface-disturbing activities are restricted November 1 to April 1	Within 1.0 mile of communal winter roost sites	Surface-disturbing or other disruptive activities will be prohibited between November 1 and April 1
–	–	–	–	–	–	–	–	Within 0.5 mile of active communal winter roost sites	No ground-disturbing activities will be permitted year-round
Golden Eagle									
Within 0.5-mile radius of nests	All surface-disturbing activities are restricted from February 1 to July 31	Within 0.5 mile of nests	Avoid surface disturbance or occupancy from February 1 to July 31, or until young birds have fledged	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are restricted or prohibited from February 1 to August 15	Within 0.5-mile radius of nests	All surface-disturbing activities are restricted February 1 to July 31	Within 1.0 mile of nests	Surface-disturbing and disruptive activities are prohibited from February 1 to July 15
–	–	Artificial nesting structure sites	0.5-mile NSO buffer	–	–	–	–	–	–
Ferruginous Hawk									
Within 1-mile radius of nests	All surface-disturbing activities are restricted from February 1 to July 31	Within 0.5 mile of nests	Avoid surface disturbance or occupancy from February 1 to July 31, or until young birds have fledged	Within 1.0 mile of nests	Surface-disturbing and disruptive activities are restricted or prohibited from February 1 to July 31	Within 1-mile radius of nests	All surface-disturbing activities are restricted March 1 to July 31	Within 1.0 mile of nests	Surface-disturbing and disruptive activities are prohibited from March 1 to July 31
–	–	Artificial nesting structure sites	0.5-mile NSO buffer with an additional 0.5-mile seasonal buffer (total of a 1-mile buffer) from February 1 to July 31, or until the young fledge	–	–	–	–	–	–

Table 4-139
Spatial and Seasonal Restrictions on Wildlife

Rock Springs BLM Field Office[1,2]		Casper BLM Field Office[1,2]		Lander BLM Field Office[1,2]		Pinedale BLM Field Office[1,2]		Rawlins BLM Field Office[1,2]	
Area to Which Restriction Applies	**Restriction**	**Area to Which Restriction Applies**	**Restriction**	**Area to Which Restriction Applies**	**Restriction**	**Area to Which Restriction Applies**	**Restriction**	**Area to Which Restriction Applies**	**Restriction**
Northern Goshawk									
Within 0.5-mile radius of nests	All surface-disturbing activities are restricted from February 1 to July 31	Within 0.5 mile of nests	Avoid surface disturbance or occupancy from February 1 to July 31, or until young birds have fledged	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are restricted or prohibited from April 1 to August 31	Within 0.5-mile radius of nests	All surface-disturbing activities are restricted February 1 to July 31	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are prohibited from February 1 to July 15
Merlin									
Within 0.5-mile radius of nests	All surface-disturbing activities are restricted from February 1 to July 31	Within 0.5 mile of nests	Avoid surface disturbance or occupancy from February 1 to July 31, or until young birds have fledged	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are restricted or prohibited from February 1 to July 31	Within 0.5-mile radius of nests	All surface-disturbing activities are restricted February 1 to July 31	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are prohibited from April 1 to July 31
Peregrine Falcon									
Within 0.5-mile radius of nests	All surface-disturbing activities are restricted from February 1 to July 31	Within 0.5 mile of nests	Avoid surface disturbance or occupancy from February 1 to July 31, or until young birds have fledged	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are restricted or prohibited from February 1 to July 31	Within 0.5-mile radius of nests	All surface-disturbing activities are restricted February 1 to July 31	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are prohibited from March 1 to July 31
Osprey									
Within 0.5-mile radius of nests	All surface-disturbing activities are restricted from February 1 to July 31	Within 0.25 mile of nests	Avoid surface disturbance or occupancy from February 1 to July 31, or until young birds have fledged	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are restricted or prohibited from February 1 to July 31	Within 0.5-mile radius of nests	All surface-disturbing activities are restricted February 1 to July 31	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are prohibited from April 1 to July 31
Burrowing Owl									
Within 0.5-mile radius of nests	All surface-disturbing activities are restricted from February 1 to July 31	Within 0.5 mile of nests	Avoid surface disturbance or occupancy from February 1 to July 31, or until young birds have fledged	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are restricted or prohibited from April 1 to September 15	Within 0.5-mile radius of nests	All surface-disturbing activities are restricted April 1 to August 15	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are prohibited from April 15 to September 15
American Kestrel									
–	Refer to Raptors restriction below	Within a 0.25-mile buffer of nests	Avoid surface disturbance or occupancy from February 1 to July 31, or until young birds have fledged	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are prohibited from April 1 to August 31
Greater Horned Owl									
–	Refer to Raptors restriction below	Within a 0.25-mile buffer of nests	Avoid surface disturbance or occupancy from February 1 to July 31, or until young birds have fledged	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below
Long-Eared Owl									
–	Refer to Raptors restriction below	Within a 0.25-mile buffer of nests	Avoid surface disturbance or occupancy from February 1 to July 31, or until young birds have fledged	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are prohibited from March 1 to July 31
Northern Saw-Whet Owl									
–	Refer to Raptors restriction below	Within a 0.25-mile buffer of nests	Avoid surface disturbance or occupancy from February 1 to July 31, or until young birds have fledged	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below
Common Barn Owl									
–	Refer to Raptors restriction below	Within a 0.25-mile buffer of nests	Avoid surface disturbance or occupancy from February 1 to July 31, or until young birds have fledged	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below
Screech Owl									
–	Refer to Raptors restriction below	-	Refer to Raptors restriction below	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are prohibited from March 1 to August 31

Table 4-139
Spatial and Seasonal Restrictions on Wildlife

Rock Springs BLM Field Office[1,2]		Casper BLM Field Office[1,2]		Lander BLM Field Office[1,2]		Pinedale BLM Field Office[1,2]		Rawlins BLM Field Office[1,2]	
Area to Which Restriction Applies	**Restriction**	**Area to Which Restriction Applies**	**Restriction**	**Area to Which Restriction Applies**	**Restriction**	**Area to Which Restriction Applies**	**Restriction**	**Area to Which Restriction Applies**	**Restriction**
Western Screech Owl									
–	Refer to Raptors restriction below	Within a 0.25-mile buffer of nests	Avoid surface disturbance or occupancy from February 1 to July 31, or until young birds have fledged	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below
Northern Goshawk									
–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	Within 0.75 mile of active raptor nests	Prohibit surface-disturbing and disruptive activities from April 1 to August 31	–	Refer to Raptors restriction below	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are prohibited from April 1 to August 31
Northern Harrier									
–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are prohibited from April 1 to July 31
Prairie Falcon									
–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are prohibited from April 1 to July 31
Red-Tailed Hawk									
–	Refer to Raptors restriction below	Within a 0.25-mile buffer of nests	Avoid surface disturbance or occupancy from February 1 to July 31, or until young birds have fledged	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below
Sharp-Shinned Hawk									
–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	–	Refer to Raptors restriction below	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are prohibited from April 1 to July 31
Swainson's Hawk									
–	Refer to Raptors restriction below	Within a 0.25-mile buffer of nests	–	–	Refer to restriction for Raptors below	–	Refer to Raptors restriction below	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are prohibited from April 1 to July 31
Raptors (other than those listed above)									
Within 0.5 mile of nests	Surface disturbance or disruptive activities are restricted from February 1 through July 31	Within a 0.5-mile buffer of nests	Avoid surface disturbance or occupancy from February 1 to July 31, or until young birds have fledged	Within 0.75 mile of active raptor nests	Prohibit surface-disturbing and disruptive activities from February 1 to July 31	Within 0.5-mile radius of nests	All surface-disturbing activities are restricted February 1 to July 31	Within 0.75 mile of nests	Surface-disturbing and disruptive activities are prohibited from February 1 to July 15
Big Game									
Elk, Antelope, Mule Deer, and Moose									
Crucial winter range	Avoidance of surface-disturbing and disruptive activities from November 15 to April 30	Crucial winter range	Surface-disturbing and wildlife disturbing activities will not be allowed from November 15 to April 30	Crucial winter range	Prohibit surface-disturbing and disruptive activities from November 15 to April 30	Crucial winter ranges	All surface-disturbing activities restricted November 15 to April 30	Crucial winter	Restricted from November 15 to April 30
Parturition areas	Avoidance of surface-disturbing and disruptive activities from May 1 to June 30	Elk crucial winter range	Prohibit surface development on certain parcels of Muddy Mountain	Parturition areas	Prohibit surface-disturbing and disruptive activities from May 1 to June 30	Within 1.0 mile of elk feedgrounds	NSO from November 15 to April 30	Migration and transitional ranges	Surface-disturbing and disruptive activities will be managed on a case-by-case basis
–	–	–	–	–	–	Parturition areas	All surface-disturbing activities are restricted from May 1 to June 30	Parturition areas	Surface-disturbing and disruptive activities will not be allowed during the period of May 1 to June 30

NOTES:
[1]Restrictions are derived from the respective BLM Field Office Approved Resource Management Plan, with the exception of the Rock Springs Field Office, which is currently operating under the Green River Resource Management Plan and Jack Morrows Hills CAP/Green River Resource Management Plan Amendment.
[2]Seasonal restriction may be shortened or extended based on data.
[3]Restrictions are derived from BLM's Wyoming Approved Resource Plan Amendment for Greater Sage-Grouse.
[4]Restrictions are derived from the BLM's Programmatic Statewide Bald Eagle Biological Assessment and included in the respective BLM Field Office Approved Resource Management Plan.

THIS PAGE INTENTIONALLY LEFT BLANK

Table 4-140 and Table 4-141 include wildlife and special status wildlife resources potentially affected by the implementation of the Project, initial and residual impacts, and the agency-required mitigation measures to be used. Residual impacts represent anticipated impacts on wildlife resources that would remain after implementation of agency-required mitigation measures to avoid, minimize, or reduce over time impacts on wildlife resources.

Table 4-140
Summary of Initial and Residual Impacts on Big Game

Resource	Initial Impact	Agency-Required Mitigation Measure	Residual Impact
Elk (*Cervus canadensis*)			
Elk Crucial Winter/Yearlong Range	High	7	Low
Elk Migration	High	7, 10	Low
Elk Parturition	High	7	Low
Antelope (*Antilocapra Americana*)			
Antelope Crucial Winter/Yearlong Range	High	7	Low
Antelope Migration	High	7, 10	Low
Mule Deer (*Odocoileus hemionus*)			
Mule Deer Crucial Winter Range	Moderate	7	Low
Mule Deer Crucial Winter/Yearlong Range	High	7	Low
Mule Deer Severe Winter Relief	High	7	Low
Mule Deer Migration	High	7, 10	Low
Mule Deer Parturition	High	7	Low
Moose (*Alces alces*)			
Moose Crucial Winter/Yearlong Range	Moderate	7	Low

NOTE: Initial impacts reflect implementation of the design features of the Proposed Action for environmental protection, which are considered part of the Applicant's Project description (and include the Applicant-committed measures [Appendix A]). Residual impacts reflect the anticipated effects that would remain after implementation of agency-required mitigation measures.

Table 4-141
Summary of Initial and Residual Impacts on Sensitive Wildlife

Resource	Initial Impact	Agency-Required Mitigation Measure	Residual Impact
Eagles			
Bald Eagle Summer Breeding	High	6, 7	Low
Bald Eagle Winter	High	6, 7	Low
Golden Eagle Breeding	High	6, 7	Low
Bureau of Land Management Sensitive Species			
Greater Sage-Grouse PHMA	High	3, 7, 8	Moderate
Greater Sage-Grouse GHMA	Moderate	7	Low
Greater Sage-Grouse SFA	High	3, 7, 8	Moderate
Greater Sage-Grouse Lek NSOs in PHMA (0.6 mile lek buffer)	High	1, 7	Moderate
Greater Sage-Grouse Lek NSOs in GHMA (0.25 mile lek buffer)	High	1, 7	Moderate
Raptors	Moderate to High	7	Low
Migratory Birds	Moderate to High	7	Low
Wyoming Pocket Gopher	Moderate to High	7	Low

Table 4-141 Summary of Initial and Residual Impacts on Sensitive Wildlife			
Resource	**Initial Impact**	**Agency-Required Mitigation Measure**	**Residual Impact**
White-Tailed Prairie Dog	Moderate to High	7	Low
Pygmy Rabbit	Moderate to High	7	Low
NOTE: Initial impacts reflect implementation of the design features of the Proposed Action for environmental protection, which are considered to be part of the Applicant's Project description (and include the Applicant-committed measures [Appendix A]). Residual impacts reflect the anticipated effects that would remain after implementation of agency-required mitigation measures.			

4.3.23.5 Results (Direct and Indirect Residual Effects)

For most wildlife species, the direct and indirect residual effects that will remain after mitigation are limited to the slow recovery of habitat cover initiated through revegetation reclamation of areas disturbed by construction. The majority of disturbance would occur in the pipeline right-of-way. The slow pace of habitat recovery is attributable to Wyoming's climate and the ecology of sagebrush and other ecological communities (Knight et al. 2014). Wyoming big sagebrush and other dominant sagebrush shrubs can take 40 to 60 years to re-establish in a disturbed right-of-way through natural propagation. This trend is reflective of most of the Wyoming land surface where disturbed habitats require long recovery times. This residual impact is anticipated for the greater sage-grouse, migratory bird habitat, big game habitat, and BLM sensitive mammal species.

4.3.23.5.1 Big Game

Table 4-142 and Table 4-143 summarize residual impacts for each big game habitat type by alternative route. Residual impacts on big game are also displayed in MV-13.

Table 4-142 Inventory Data and Residual Impacts for Mule Deer								
Alternative	**Total Miles**	**Resource Inventory (miles crossed)**					**Residual Impacts (miles)[1]**	
		Migration	**Parturition**	**Crucial Winter**	**Crucial Winter Yearlong**	**Severe Winter**	**None**	**Low**
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant								
1A: Proposed Action	30.4	0.6	0.0	22.9	0.0	0.0	7.5	22.9
1A Variation: Dry Basin Draw	30.7	1.2	0.0	23.2	0.0	0.0	7.5	23.2
1B: Dry Piney	34.5	1.7	0.0	27.0	0.0	0.0	7.5	27.0
1C: Figure Four	38.5	2.3	0.0	31.5	0.0	0.0	7	31.5
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect								
2A: Proposed Action	129.1	0.0	1.0	5.7	0.0	5.5	116.9	12.2
2B: Southern Route	136.2	1.2	0.0	0.0	6.9	1.2	128.1	8.1

Table 4-142
Inventory Data and Residual Impacts for Mule Deer

Alternative	Total Miles	Resource Inventory (miles crossed)					Residual Impacts (miles)[1]	
		Migration	Parturition	Crucial Winter	Crucial Winter Yearlong	Severe Winter	None	Low
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect								
3A: Proposed Action	83.2	1.6	0.0	0.0	12.7	0.0	68.9	14.3
3B: Lost Creek to Lost Cabin	73.0	1.6	0.0	0.0	4.4	0.0	67	6.0
3C: Lost Creek to Highway 20/26	101.4	1.6	0.0	0.0	5.6	0.0	94.2	7.2

NOTE: [1]With the implementation of agency-required mitigation measures identified for this resource, no high or moderate impacts would be anticipated. Residual impacts will not add to the total miles of habitat types crossed due to the overlapping habitats.

Table 4-143
Inventory Data and Residual Impacts for Antelope, Elk, and Moose

Alternative Route	Total Miles	Resource Inventory (miles crossed)						Residual Impacts (miles)[1]	
		Antelope Crucial Winter Yearlong	Antelope Migration	Elk Crucial Winter Yearlong	Elk Migration	Elk Parturition	Moose Crucial Winter Yearlong	None	Low
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant									
1A: Proposed Action	30.4	12.7	2.1	3.5	0.0	0.0	7.3	9.9	20.5
1A Variation: Dry Basin Draw	30.7	12.8	2.2	3.5	0.0	0.0	7.3	10.1	20.6
1B: Dry Piney	34.5	6.4	2.2	3.5	0.0	0.0	7.3	19.3	15.2
1C: Figure Four	38.5	7.2	2.3	3.5	0.0	0.0	7.1	23.1	15.4
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect									
2A: Proposed Action	129.1	31.6	5.7	12.4	2.0	1.0	0.0	80.8	48.3
2B: Southern Route	136.2	46.2	3.9	11.6	6.4	0.0	0.0	78.8	57.4
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect									
3A: Proposed Action	83.2	21.5	1.8	0.0	0.0	0.0	1.1	58.8	24.4
3B: Lost Creek to Lost Cabin	73.0	15.0	1.8	0.0	0.0	0.0	1.1	55.1	17.9
3C: Lost Creek to Highway 20/26	101.4	29.0	1.8	0.0	0.0	0.0	1.1	69.5	31.9

NOTE: [1]With the implementation of agency-required mitigation measures identified for this resource, no high or moderate impacts would be anticipated. Residual impacts will not add to the total miles of habitat types crossed due to the overlapping habitats.

4.3.23.5.1.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment will remain as it presently exists.

4.3.23.5.1.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction

The proposed Riley Ridge Sweetening Plant is not located within mule deer migration routes, parturition areas, crucial winter/yearlong range, or severe winter range; pronghorn antelope migration routes or crucial winter/yearlong range; elk migration routes, parturition areas, or crucial winter/yearlong range; or moose crucial winter/yearlong range. Therefore, no direct impacts on big game populations are anticipated from construction or operation of this facility. Indirect effects on big game could include displacement or avoidance of pronghorn antelope in crucial winter/yearlong habitat or other big game species dispersing near the Riley Ridge Sweetening Plant as a result of noise associated with Riley Ridge Sweetening Plant construction and operations. The Riley Ridge Sweetening Plant is located approximately 0.8 mile from pronghorn antelope crucial winter/yearlong habitat. Once construction is complete, the operational noise of the Riley Ridge Sweetening Plant is predicted to be clearly audible within a 0.9-mile radius of the plant but occasionally audible at greater distances when not masked by other manmade or natural noise sources. Refer to Section 4.3.9 for explanation of the noise analysis and results.

Injection Wells

The proposed injection wells are in proximity to the same big game habitats as the proposed Riley Ridge Sweetening Plant. Potential impacts on big game from injection wells would be the same as those discussed for the Riley Ridge Sweetening Plant.

Segment 1 Pipeline Alternative Routes

Based on the impact assessment criteria used in this analysis (Table 4-138), all alternative routes in Segment 1 would have low residual impacts on mule deer, pronghorn antelope, elk, and moose populations (MV-13, Table 4-142 and Table 4-143).

All alternative routes in Segment 1 cross mule deer migration routes and crucial winter range, pronghorn antelope migration routes and crucial winter/yearlong range, elk crucial winter/yearlong range, and moose crucial winter/yearlong range. Alternative 1A: Proposed Action crosses fewer miles of mule deer migration routes and crucial winter range than the other three alternative routes but crosses more miles of pronghorn antelope crucial winter/yearlong range than Alternatives 1B: Dry Piney and 1C: Figure Four. All four alternative routes would affect the same amount of elk crucial winter/yearlong range and similar amounts of antelope migration routes and moose crucial winter/yearlong range.

All alternative routes in Segment 1 are in a complex of big game habitats identified as issues of concern, including pronghorn antelope and mule deer migration routes (MV-13). Big game typically uses these migration routes to move to seasonal ranges, most often between winter and summer ranges. Nearly all of the alternative routes are in mule deer crucial winter range. The moose crucial winter/yearlong range crossed by all four alternative routes in Segment 1 parallels the Green River with its riparian vegetation and lower elevation well suited for moose. Moose crucial winter/yearlong range is also present on the route connector between the proposed Riley Ridge Sweetening Plant and the existing Riley Ridge Treatment Plant terminus.

Without mitigation, such as seasonal restrictions, construction and maintenance activities could result in big game displacement or avoidance during the critical winter months or migration periods (Feeney et al. 2004; Coupal et al. 2004). Recent studies have shown that big game species time their migration to target higher quality forage (Sawyer and Kauffman 2011). Development in migration routes has the potential to affect the timing of migrations (Lendrum et al. 2013). Potential impacts on big game may include delayed departure, more rapid migration, and early arrival to parturition areas. All of these impacts can affect animal condition, viability, and survival. Big game species could also experience an increase in physiological stress from noise associated with construction, operation, and maintenance activities. Additionally, removal of native vegetation during Project construction could temporarily alter browse quality and quantity.

After the application of mitigation measures that would avoid surface-disturbing or disrupting activities during sensitive periods (Agency-Required Mitigation Measure 7) and limit accessibility in sensitive habitats (Agency-Required Mitigation Measure 10) (Table 4-140), impacts on big game species would be limited to a temporary minor loss of forage in seasonal habitat areas, a potential increase in weeds, and an increase in human use and activity in these habitats due to construction of new access roads. These effects are not anticipated to adversely influence big game populations in Segment 1.

4.3.23.5.1.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Based on the impact assessment criteria used in this analysis (Table 4-138), both alternative routes in Segment 2 would have low residual impacts on mule deer, pronghorn antelope, and elk populations (MV-13, Table 4-142, and Table 4-143).

Both alternative routes in Segment 2 cross mule deer severe winter range, pronghorn antelope crucial winter/yearlong range and migration routes, and elk crucial winter/yearlong range and migration routes. In addition, Alternative 2A: Proposed Action crosses mule deer parturition areas and severe winter range and elk parturition areas, and Alternative 2B: Southern Route crosses mule deer migration routes and crucial winter/yearlong range areas.

Extensive crucial winter range and migration routes for elk, antelope, and mule deer are in the western portion of Segment 2. The mule deer crucial winter range and migration corridor crossed by both alternative routes in the vicinity of Farson are associated with the southern end of the Red Desert to Hoback Migration Route (Sawyer 2014). At approximately 150.0 miles, the Red Desert to Hoback Migration Route is the longest mule deer seasonal migration route and one of the longest distinct ungulate migration movements in North America. Mule deer seasonally migrate between high elevation summer range in the north and lower elevational winter range in the south. The diversity of big game habitats in Segment 2 reflects the importance of this portion of the Great Divide Basin for wintering big game that migrate from higher elevations to the north. In the eastern portion of Segment 2, where the two alternative routes follow the same route, pronghorn antelope migration routes are crossed, but no other big game habitats are affected.

Without mitigation, such as seasonal restrictions, construction and maintenance activities could result in big game displacement or avoidance during the critical winter months or migration periods (Feeney et al. 2004; Coupal et al. 2004). Recent studies have shown that big game species time their migration to target higher quality forage (Sawyer and Kauffman 2011). Development in migration routes has the potential to affect the timing of migrations (Lendrum et al. 2013). Potential impacts on big game may include delayed departure, more rapid migration, and early arrival to parturition areas. All of these impacts can affect animal condition, viability, and survival. Big game species could also experience an increase in physiological stress from noise associated with construction, operation, and maintenance activities.

Additionally, removal of native vegetation during Project construction could temporarily alter browse quality and quantity.

After the application of mitigation measures that would avoid surface-disturbing or disrupting activities during sensitive periods (Agency-Required Mitigation Measure 7) and limit accessibility in sensitive habitats (Agency-Required Mitigation Measure 10) (Table 4-140), impacts on big game species would be limited to a temporary minor loss of forage in seasonal habitat areas, a potential increase in weeds, and an increase in human use and activity in these habitats due to construction of new access roads. These effects are not anticipated to adversely influence big game populations in Segment 2.

4.3.23.5.1.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Based on the impact assessment criteria used in this analysis (Table 4-138), all alternative routes in Segment 3 would have low residual impacts on mule deer, pronghorn antelope, and moose populations (MV-13, Table 4-142, and Table 4-143).

All alternative routes in Segment 3 cross mule deer migration routes and crucial winter/yearlong range, pronghorn antelope migration routes and crucial winter/yearlong range, and moose crucial winter/yearlong range. All three alternative routes cross the same pronghorn antelope migration routes and moose crucial winter/yearlong range.

The moose crucial winter yearlong habitat crossed by all three alternative routes parallels the Sweetwater River. Big game habitats near the southern portion of Segment 3 are concentrated in the geologic gap and lower elevations near Jeffrey City. This gap provides a topographic route for big game migration as well as suitable winter range near the Sweetwater River.

As shown in MV-13, Alternatives 3B: Lost Creek to Lost Cabin and 3C: Lost Creek to Highway 20/26 cross mule deer and pronghorn antelope crucial winter/yearlong range north and east of where they diverge from Alternative 3A: Proposed Action. The lack of other seasonal ranges and migration routes is attributable to the greater distances these alternative routes are to higher elevation parturition and summer habitats.

Without mitigation, such as seasonal restrictions, construction and maintenance activities could result in big game displacement or avoidance during the critical winter months or migration periods (Feeney et al. 2004; Coupal et al. 2004). Recent studies have shown that big game species time their migration to target higher quality forage (Sawyer and Kauffman 2011). Development in migration routes has the potential to affect the timing of migrations (Lendrum et al. 2013). Potential impacts on big game may include delayed departure, more rapid migration, and early arrival to parturition areas. All of these impacts can affect animal condition, viability, and survival. Big game species could also experience an increase in physiological stress from noise associated with construction, operation, and maintenance activities. Additionally, removal of native vegetation during Project construction could temporarily alter browse quality and quantity.

After the application of mitigation measures that would avoid surface-disturbing or disrupting activities during sensitive periods (Agency-Required Mitigation Measure 7) and limit accessibility in sensitive habitats (Agency-Required Mitigation Measure 10) (Table 4-140), impacts on big game species would be limited to a minor loss of forage in seasonal habitat areas, a potential increase in weeds, and an increase in human use and activity in these habitats due to construction of new access roads. These effects are not anticipated to adversely influence big game populations in Segment 3.

4.3.23.5.1.5 230-Kilovolt Transmission Line

While the proposed alignment of the 230kV transmission line would not cross mapped designated big game range, pronghorn antelopes are known to use the area. Construction and maintenance activities could result in pronghorn displacement or avoidance. Pronghorn could also experience an increase in physiological stress from noise associated with construction, operation, and maintenance activities. Additionally, removal of native vegetation during Project construction could temporarily alter browse quality and quantity. Mitigation for the 230kV transmission line impacts on big game will follow the same process described for the alternative routes.

4.3.23.5.1.6 Mainline Valve Distribution Lines

The locations of the approximately 24 distribution lines that would be required to power the MLVs along the pipeline are not known. After the application of mitigation measures, residual impacts on big game would be low. Based on locations of the distribution lines along the selected route, mitigation for distribution line construction impacts on big game will follow the same process described for the alternative routes. All associated distribution line construction access roads will be reclaimed. Residual direct impacts could be minimized through use of solar power at the MLVs.

4.3.23.5.2 Endangered Species Act Listed Species

The Biological Assessment prepared for the USFWS Section 7 consultation process will address potential Project effects on ESA-listed species. On completion of the process, the USFWS will issue a Biological Opnion with a determination of effect for each species. The BO could potentially include additional mitigation measures, as well as verification of mitigation measures described in this chapter.

4.3.23.5.2.1 Canada Lynx

The Project is within the USFWS mapped AOI for Canada lynx. However, Canada lynx are primarily found in high-elevation coniferous forest and the Project does not cross any areas known or likely to be occupied by resident Canada lynx.

No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and habitat for the Canada lynx will remain as it presently exists.

Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction

Potential impacts on Canada lynx would be the same as those discussed below for the Segment 1 pipeline alternative routes.

Injection Wells

Potential impacts on Canada lynx would be the same as those discussed below for the Segment 1 pipeline alternative routes.

Segment 1 Pipeline Alternative Routes

Segment 1 alternative routes cross areas included in the USFWS mapped AOI for Canada lynx. However, the Canada lynx are primarily found in high-elevation coniferous forest and the Project does not cross any areas known or likely to be occupied by resident Canada lynx. If Canada lynx disperse through the Project

area, the potential for disturbance and vehicle-related mortality could increase due to human presence, noise, and vehicle use associated with Project construction, operations, and maintenance activities.

Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

No impacts on Canada lynx are anticipated in Segment 2. Segment 2 alternative routes are not located within the USFWS mapped AOI for Canada lynx.

Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Interconnect

No impacts on Canada lynx are anticipated in Segment 3. Segment 3 alternative routes are not located within the USFWS mapped AOI for Canada lynx.

230-Kilovolt Transmission Line

The 230kV transmission line does not cross any areas known or likely to be occupied by resident Canada lynx.

4.3.23.5.2.2 Western Yellow-Billed Cuckoo

No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment will remain as it presently exists.

Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant

No impacts on yellow-billed cuckoo are anticipated from the proposed Sweeting Plant as the Sweeting Plant is located approximately 7 miles from the Green River, which contains the closest riparian habitat that could potentially support yellow-billed cuckoo.

Injection Wells

No impacts on yellow-billed cuckoo are anticipated from the proposed injection wells as the injection wells are located approximately 7 miles from the Green River, which contains the closest riparian habitat that could potentially support yellow-billed cuckoo.

Segment 1 Pipeline Alternative Routes

All alternative routes in Segment 1 cross riparian habitat occurring in the mapped USFWS AOI for yellow-billed cuckoo along the Green River. The riparian area crossed by Alternatives 1A: Proposed Action, 1A Variation: Dry Basin Draw, and 1B: Dry Piney is known to possess habitat features that would make it more suitable for yellow-billed cuckoo than the riparian area crossed by Alternative 1C: Figure Four, but the areas have not yet been surveyed either for habitat suitability or for the presence of yellow-billed cuckoo using approved protocol. The riparian area is known to have cottonwood trees; however, the understory is limited. All alternative routes are located north of the USFWS proposed critical habitat area. Surveys for suitable nesting habitat would be conducted prior to construction for the selected route and if suitable nesting habitat is present, field surveys for yellow-billed cuckoo would be conducted. If yellow-billed cuckoo were found to be present, seasonal restrictions would be determined through the USFWS Section 7 consultation. In addition, the Applicant proposed the use of HDD to avoid disturbance riparian habitat on both sides of the river.

Without avoidance, if occupied yellow-billed cuckoo habitat is present, direct effects could include permanent and temporary habitat loss, habitat displacement, disruption of nesting, and mortality,

including destruction of nests, eggs, and young. Indirect effects on yellow-billed cuckoo could include habitat fragmentation.

Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

No impacts on yellow-billed cuckoo are anticipated in Segment 2. Segment 2 alternative routes are located outside of the mapped USFWS yellow-billed cuckoo AOI.

Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Interconnect

No impacts on yellow-billed cuckoo are anticipated in Segment 3. Segment 3 alternative routes are located outside of the mapped USFWS yellow-billed cuckoo AOI.

230-Kilovolt Transmission Line

The alignment of the 230kV transmission line is located outside of the mapped USFWS yellow-billed cuckoo AOI.

Mainline Valve Distribution Lines

The locations of the approximately 24 distribution lines that would be required to power the MLVs along the pipeline are not known. The transmission line tower spacing and siting would be refined to avoid potentially suitable habitat for yellow-billed cuckoo. To minimize potential impacts on avian species, the Project design and construction will follow PacifiCorp's Avian-Safe Design Standards for substations and power lines, which adheres to *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (Avian Power Line Interaction Committee 2006) and PacifiCorp's Avian Protection Plan(s).

If occupied yellow-billed cuckoo habitat is present in proximity to the MLV distribution lines, without mitigation, direct effects could include habitat loss and displacement and mortality from collision or electrocution, and indirect effects could include habitat fragmentation.

4.3.23.5.3 Migratory Birds

Impacts on non-raptorial migratory birds, including BLM sensitive migratory bird species, are discussed collectively in this section as potential impacts and mitigation measures are similar for all migratory bird species. Raptor species are discussed in Section 4.3.23.5.4. BLM sensitive migratory bird species addressed in this section include Brewer's sparrow, loggerhead shrike, long-billed curlew, mountain plover, sage sparrow, and sage thrasher.

Nearly all naturally vegetated and undisturbed surface in the Project area is potential nesting and seasonal or year-round habitat for migratory birds, and most non-game and native birds and their nests are protected under the MBTA. Design features and agency-required mitigation measures will be implemented to meet the requirements of the MBTA, Additionally, late spring and early summer seasonal restrictions implemented for greater sage-grouse and big game will overlap with most of the migratory bird breeding period, providing protections for some, but not all, of the habitat for nesting migratory birds in the Project area.

4.3.23.5.3.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment will remain as it presently exists.

4.3.23.5.3.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant

The proposed Riley Ridge Sweetening Plant is in WYNDD-mapped habitat for sagebrush sparrow but is not in WYNDD-mapped habitat for loggerhead shrike, long-billed curlew, mountain plover, or sage thrasher. Potential impacts on BLM sensitive and other migratory bird species would be the same as those discussed below for the Segment 1 pipeline alternative routes.

Injection Wells

The proposed injection wells are in proximity to the same BLM sensitive and other migratory bird species habitats as the proposed Riley Ridge Sweetening Plant. Potential impacts on BLM sensitive and other migratory bird species would be the same as those discussed below for the Segment 1 pipeline alternative routes.

Segment 1 Pipeline Alternative Routes

Based on the impact assessment criteria used in this analysis (Table 4-138), all alternative routes in Segment 1 would have low residual impacts on BLM sensitive and other migratory bird species. All of the alternative routes in Segment 1 cross WYNDD mapped habitat for loggerhead shrike, long-billed curlew, mountain plover, sagebrush sparrow, and sage thrasher (Table 3-167). Alternatives 1A: Proposed Action and 1B: Dry Piney cross less sage thrasher and sagebrush sparrow habitat than Alternative 1C: Figure Four. Alternative 1B: Dry Piney crosses less mountain plover habitat compared to the other alternative routes. Relatively similar amounts of habitat for loggerhead shrike and long-billed curlew would be crossed by the three alternative routes.

Migratory birds are most vulnerable to impacts and potential incidental take during the nesting season. Potential impacts on migratory birds include permanent and temporary habitat loss; the potential for nest or young abandonment due to construction activities or an increase in human presence; mortality of birds, including collisions and destruction of nests, eggs, and young; fragmentation of habitat; and an increase in invasive or noxious weeds (e.g., cheatgrass) in the study area.

Residual impacts on BLM sensitive and other migratory bird species would be anticipated to be low as a result of implementation of design features and agency-required mitigation measures. Preconstruction surveys (Design Feature 1) would identify the most recent nest activity status, new nests, and any modifications needed to minimize impacts on nesting migratory birds. Seasonal and spatial restrictions for mountain plover will provide additional protections for this species during construction (Table 4-139). Mortality from collisions with Project vehicles would be minimized through implementation of a 35 mph speed limit in the Project area (Design Feature 3). Also, intense reclamation of riparian habitats and wetlands, areas of particular importance to migratory birds, would be required (Agency-Required Mitigation Measure 8). Without reclamation that includes soil management and reseeding, invasive or noxious vegetation may establish, reducing habitat and cover quality and quantity. Reclamation of disturbed areas would promote the re-establishment of migratory bird habitat.

4.3.23.5.3.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Based on the impact assessment criteria used in this analysis (Table 4-138), all alternative routes in Segment 2 would have low residual impacts on BLM sensitive and other migratory bird species. Both alternative routes in Segment 2 cross WYNDD mapped habitat for mountain plover, long-billed curlew, and sagebrush sparrow (Table 3-167). Less sagebrush sparrow and mountain plover habitat would be

crossed by Alternative 2A: Proposed Action relative to Alternative 2B: Southern Route. Relatively similar amounts of long-billed curlew habitat would be crossed by the two alternative routes.

Migratory birds are most vulnerable to impacts and potential incidental take during the nesting season. Potential impacts on migratory birds include permanent and temporary habitat loss; the potential for nest or young abandonment due to construction activities or an increase in human presence; mortality of birds, including collisions and destruction of nests, eggs, and young; fragmentation of habitat; and an increase in invasive or noxious weeds (e.g., cheatgrass) in the study area.

Residual impacts on BLM sensitive and other migratory bird species would be anticipated to be low as a result of implementation of design features and agency-required mitigation measures. Preconstruction surveys (Design Feature 1) would identify the most recent nest activity status, new nests, and any modifications needed to minimize impacts on nesting migratory birds. Seasonal and spatial restrictions for mountain plover will provide additional protections for this species during construction (Table 4-139). Mortality from collisions with Project vehicles would be minimized through implementation of a 35 mph speed limit in the Project area (Design Feature 3). Also, intense reclamation of riparian habitats and wetlands, areas of particular importance to migratory birds, would be required (Agency-Required Mitigation Measure 8). Without reclamation that includes soil management and reseeding, invasive or noxious vegetation may establish, reducing habitat and cover quality and quantity. Reclamation of disturbed areas would promote the re-establishment of migratory bird habitat.

4.3.23.5.3.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Interconnect

Based on the impact assessment criteria used in this analysis (Table 4-138), all alternative routes in Segment 3 would have low residual impacts on BLM sensitive and other migratory bird species. All of the alternative routes in Segment 3 cross WYNDD mapped habitat for loggerhead shrike, mountain plover, and sagebrush sparrow; only Alternatives 3A: Proposed Action and 3C: Lost Creek to Highway 20/26 cross long-billed curlew mapped habitat with a greater amount of habitat crossed by Alternative 3A: Proposed Action (Table 3-167). Less sagebrush sparrow habitat would be crossed by Alternative 3B: Lost Creek to Lost Cabin. Mountain plover would have less habitat crossed by Alternatives 3A: Proposed Action and 3B: Lost Creek to Lost Cabin compared to Alternative 3C: Lost Creek to Highway 20/26. Relatively similar amounts of loggerhead shrike habitat would be crossed by the three alternative routes.

Migratory birds are most vulnerable to impacts and potential incidental take during the nesting season. Potential impacts on migratory birds include permanent and temporary habitat loss; the potential for nest or young abandonment due to construction activities or an increase in human presence; mortality of birds, including collisions and destruction of nests, eggs, and young; fragmentation of habitat; and an increase in invasive or noxious weeds (e.g., cheatgrass) in the study area.

Residual impacts on BLM sensitive and other migratory bird species would be anticipated to be low as a result of implementation of design features and agency-required mitigation measures. Preconstruction surveys (Design Feature 1) would identify the most recent nest activity status, new nests, and any modifications needed to minimize impacts on nesting migratory birds. Seasonal and spatial restrictions for mountain plover will provide additional protections for this species during construction (Table 4-139). Mortality from collisions with Project vehicles would be minimized through implementation of a 35 mph speed limit in the Project area (Design Feature 3). Also, intense reclamation of riparian habitats and wetlands, areas of particular importance to migratory birds, would be required (Agency-Required Mitigation Measure 8). Without reclamation that includes soil management and reseeding, invasive or noxious vegetation may establish, reducing habitat and cover quality and quantity. Reclamation of disturbed areas would promote the re-establishment of migratory bird habitat.

4.3.23.5.3.5 230-Kilovolt Transmission Line

The proposed 230kV transmission line could potentially affect habitat for migratory birds, including BLM sensitive migratory bird species. Without mitigation, direct effects on migratory birds could include habitat loss and displacement and mortality from collision and electrocution, and indirect effects could include habitat fragmentation. Residual impacts on migratory birds would be low due to implementation of design features and agency-required mitigation measures. Preconstruction surveys (Design Feature 1) for migratory birds would identify the most recent nest activity status, new nests, and any modifications needed to minimize impacts of construction activities on these species. To minimize potential impacts on avian species, the Project design and construction will follow PacifiCorp's Avian-Safe Design Standards for substations and power lines, which adheres to *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (Avian Power Line Interaction Committee 2006) and PacifiCorp's Avian Protection Plan(s).

4.3.23.5.3.6 Mainline Valve Distribution Lines

The locations of the approximately 24 distribution lines that would be required to power the MLVs along the pipeline are not known. The MLV distribution lines could potentially affect habitat for migratory birds, including BLM sensitive migratory bird species. Without mitigation, direct effects on migratory birds could include habitat loss and displacement and mortality from collision or electrocution, and indirect effects could include habitat fragmentation. Residual impacts on migratory birds would be low due to implementation of design features and agency-required mitigation measures. Preconstruction surveys (Design Feature 1) for migratory birds would identify the most recent nest activity status, new nests, and any modifications needed to minimize impacts of construction activities on migratory birds. To minimize potential impacts on avian species, the Project design and construction would follow PacifiCorp's Avian-Safe Design Standards for substations and power lines, which adheres to *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (Avian Power Line Interaction Committee 2006) and PacifiCorp's Avian Protection Plan(s).

4.3.23.5.4 Raptors

Impacts on raptor species, including BLM sensitive raptor species, are discussed collectively in this section as potential impacts and mitigation measures are similar for all raptor species. BLM sensitive raptor species addressed in this section include bald eagle, golden eagle, burrowing owl, ferruginous hawk, merlin, northern goshawk, osprey, and peregrine falcon.

All raptors and their nests are protected under the MBTA. Design features and agency-required mitigation measures will be implemented to meet the requirements of the MBTA. Late spring and early summer seasonal restrictions implemented for greater sage-grouse and big game will overlap with the breeding period for some raptor species, providing additional protections for nesting raptors.

Bald and golden eagles are also protected under the BGEPA. A Bald and Golden Eagle Monitoring Plan would be developed to achieve compliance with the MBTA and BGEPA.

Table 4-144
Inventory Data and Residual Impacts for Bald and Golden Eagles

Alternative Route	Total Miles	Resource Inventory (miles crossed)			Residual Impacts (miles)[1]	
		Bald Eagle Breeding	Bald Eagle Wintering	Golden Eagle Breeding	None	Low
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant						
1A: Proposed Action	30.4	11.4	1.6	30.2	0.1	30.3
1A Variation: Dry Basin Draw	30.7	11.4	1.6	30.5	0.1	30.6
1B: Dry Piney	34.5	11.5	4.9	33.3	0.5	34.0
1C: Figure Four	38.5	11.7	2.9	37.7	0.8	37.7
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect						
2A: Proposed Action	129.1	2.5	0.0	129.1	0	129.1
2B: Southern Route	136.2	1.6	0.0	136.1	0.1	136.1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect						
3A: Proposed Action	83.2	3.2	7.6	81.0	1.2	82.0
3B: Lost Creek to Lost Cabin	73.0	1.5	6.7	71.1	1.4	71.6
3C: Lost Creek to Highway 20/26	101.4	6.8	30.9	61.8	15.5	85.9

NOTE: [1]With the implementation of agency-required mitigation measures identified for this resource, no high or moderate impacts would be anticipated.
Source: WYNDD 2015.

4.3.23.5.4.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment will remain as it presently exists.

4.3.23.5.4.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant

The proposed Riley Ridge Sweetening Plant is located in golden eagle breeding habitat and WYNDD-mapped osprey breeding habitat but is not located in bald eagle breeding and wintering habitat or WYNDD-mapped northern goshawk and peregrine falcon breeding habitat. Ferruginous hawk nests are known to occur within 1 mile of the Riley Ridge Sweetening Plant. Potential impacts on BLM sensitive and other raptor species would be the same as those discussed below for the Segment 1 pipeline alternative routes.

Injection Wells

The proposed injection wells are in proximity to the same BLM sensitive and other raptor species habitats as the proposed Riley Ridge Sweetening Plant. Potential impacts on BLM sensitive and other raptor species would be the same as those discussed below for the Segment 1 pipeline alternative Routes.

Segment 1 Pipeline Alternative Routes

Based on the impact assessment criteria used in this analysis (Table 4-138), all alternative routes in Segment 1 would have low residual impacts on BLM sensitive and other raptor species. Results from the quantitative analysis for bald and golden eagles are presented in Table 4-144 and MV-14. All alternative routes in Segment 1 cross bald eagle breeding and wintering habitat and golden eagle breeding habitat (Table 4-144) and WYNDD mapped northern goshawk, osprey, and peregrine falcon breeding habitat.

Golden eagle, ferruginous hawk, prairie falcon, and red-tailed hawk nests are known to occur within 1 mile of each of the alternative routes (Table 3-167).

Similar to other migratory birds, raptors are most vulnerable to impacts and potential incidental take during the nesting season. Potential impacts on raptors include permanent and temporary loss of habitat (primarily foraging habitat); the potential for nest or young abandonment due to construction activities or an increase in human presence; mortality of birds, including collisions destruction of nests, eggs, and young; fragmentation of habitat; and an increase in invasive or noxious weeds (e.g., cheatgrass) in the Project area.

Residual impacts on BLM sensitive and other raptor species would be anticipated to be low as a result of implementation of design features and agency-required mitigation measures, as well as the Bald and Golden Eagle Monitoring Plan. Preconstruction surveys (Design Feature 1) would identify the most recent nest activity status, new nests, and any modifications needed to minimize impacts on nesting raptors. Seasonal and spatial restrictions for nesting raptors will restrict construction during the breeding season near active nests and in bald eagle winter concentration areas (Table 4-139). Mortality from collisions with Project vehicles would be minimized through implementation of a 35 mph speed limit in the Project area (Design Feature 3). Also, intense reclamation of riparian habitats and wetlands, areas of particular importance to raptors, would be required (Agency-Required Mitigation Measure 8). Without reclamation that includes soil management and reseeding, invasive or noxious vegetation may establish, reducing habitat and cover quality and quantity. Reclamation of disturbed areas would promote the re-establishment of raptor habitat (primarily foraging habitat).

4.3.23.5.4.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Based on the impact assessment criteria used in this analysis (Table 4-138), all alternative routes in Segment 2 would have low residual impacts on BLM sensitive and other raptor species. Results from the quantitative analysis for bald and golden eagles are presented in Table 4-144 and MV-14. All alternative routes in Segment 2 cross bald and golden eagle breeding habitat (Table 4-144), and WYNDD mapped northern goshawk, merlin, and peregrine falcon breeding habitat. Golden eagle, ferruginous hawk, prairie falcon, red-tailed hawk, American kestrel, and burrowing owl nests are known to occur within 1 mile of each of the alternative routes (Table 3-167). In addition, a Swainson’s hawk nest is known to occur within 1 mile of Alternative 2A: Proposed Action.

Similar to other migratory birds, raptors are most vulnerable to impacts and potential incidental take during the nesting season. Potential impacts on raptors include permanent and temporary loss of habitat (primarily foraging habitat); the potential for nest or young abandonment due to construction activities or an increase in human presence; mortality of birds, including collisions and destruction of nests, eggs, and young; fragmentation of habitat; and an increase in invasive or noxious weeds (e.g., cheatgrass) in the Project area.

Residual impacts on BLM sensitive and other raptor species would be anticipated to be low as a result of implementation of design features and agency-required mitigation measures, as well as the Bald and Golden Eagle Monitoring Plan. Preconstruction surveys (Design Feature 1) would identify the most recent nest activity status, new nests, and any modifications needed to minimize impacts on nesting raptors. Seasonal and spatial restrictions for nesting raptors will restrict construction near active nests and in bald eagle winter concentration areas during the breeding season (Table 4-139). Mortality from collisions with Project vehicles would be minimized through implementation of a 35-mph speed limit in the Project area (Design Feature 3). Also, intense reclamation of riparian habitats and wetlands, areas of particular importance to raptors, would be required (Agency-Required Mitigation Measure 8). Without

reclamation that includes soil management and reseeding, invasive or noxious vegetation may establish, reducing habitat and cover quality and quantity. Reclamation of disturbed areas would promote the re-establishment of raptor habitat (primarily foraging habitat).

4.3.23.5.4.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Interconnect

Based on the impact assessment criteria used in this analysis (Table 4-138), all alternative routes in Segment 3 would have low residual impacts on BLM sensitive and other raptor species. Results from the quantitative analysis for bald and golden eagles are presented in Table 4-144 and MV-14. All alternative routes in Segment 3 cross bald eagle breeding and wintering habitat, golden eagle breeding habitat (Table 4-144) and WYNDD mapped merlin breeding habitat. Bald eagle wintering habitat is crossed at the Sweetwater River. The wintering habitat provides open water, suitable roosting habitat, and a greater abundance of prey in the winter for bald eagle.

Ferruginous hawk, prairie falcon, red-tailed hawk, Swainson's hawk, great horned owl, burrowing owl, and American kestrel nests are known to occur within 1 mile of each of the alternative routes (Table 3-167). In addition, a golden eagle nest is within 1 mile of Alternative 3B: Lost Creek to Lost Cabin, and a northern harrier nest is within 1 mile of Alternative 3A: Proposed Action.

Similar to other migratory birds, raptors are most vulnerable to impacts and potential incidental take during the nesting season. Potential impacts on raptors include permanent and temporary loss of habitat (primarily foraging habitat); the potential for nest or young abandonment due to construction activities or an increase in human presence; mortality of birds, including collisions and destruction of nests, eggs, and young; fragmentation of habitat; and an increase in invasive or noxious weeds (e.g., cheatgrass) in the Project area.

Residual impacts on BLM sensitive and other raptor species would be anticipated to be low as a result of implementation of design features and agency-required mitigation measures, as well as the Bald and Golden Eagle Monitoring Plan. Preconstruction surveys (Design Feature 1) would identify the most recent nest activity status, new nests, and any modifications needed to minimize impacts on nesting raptors. Seasonal and spatial restrictions for nesting raptors will restrict construction near active nests and in bald eagle winter concentration areas during the breeding season (Table 4-139). Mortality from collisions with Project vehicles would be minimized through implementation of a 35-mph speed limit in the Project area (Design Feature 3). Also, intense reclamation of riparian habitats and wetlands, areas of particular importance to raptors, would be required (Agency-Required Mitigation Measure 8). Without reclamation that includes soil management and reseeding, invasive or noxious vegetation may establish, reducing habitat and cover quality and quantity. Reclamation of disturbed areas would promote the re-establishment of raptor habitat (primarily foraging habitat).

4.3.23.5.4.5 230-Kilovolt Transmission Line

The proposed 230kV transmission line is located in bald and golden eagle breeding habitat and could affect habitat for other raptor species. Seasonal and spatial restrictions for nesting raptors will restrict construction during the breeding season near active nests and in bald eagle winter concentration areas (Table 4-139).

To minimize potential impacts on avian species, the Project design and construction will follow PacifiCorp's Avian-Safe Design Standards for substations and power lines, which adheres to *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (Avian Power Line Interaction Committee 2006) and PacifiCorp's Avian Protection Plan(s). Additional mitigation could include burial of the transmission lines to reduce bird perching, as well as collision risks.

Without mitigation, direct effects on BLM sensitive and other raptor species could include habitat loss and displacement and mortality from collision or electrocution, and indirect effects could include habitat fragmentation.

4.3.23.5.4.6 Mainline Valve Distribution Lines

The locations of the approximately 24 distribution lines that would be required to power the MLVs along the pipeline are not known but are assumed and are described in Chapter 2. The transmission line tower spacing and siting will be adjustable to avoid direct impacts on nesting raptors. To minimize potential impacts on avian species, the Project design and construction will follow PacifiCorp's Avian-Safe Design Standards for substations and power lines, which adheres to *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (Avian Power Line Interaction Committee 2006) and PacifiCorp's Avian Protection Plan(s). In addition, raptor perching deterrents will be installed on the line towers and other potential roosting points. Additional mitigation could include burial of the distribution line or using solar power at the MLV to reduce habitat disturbance and collision risks.

Without mitigation, direct effects on BLM sensitive and other raptor species could include habitat loss and displacement and mortality from collision or electrocution, and indirect effects could include habitat fragmentation.

4.3.23.5.5 Greater Sage-Grouse

Greater sage-grouse impact analyses and mitigation are based on demonstrating compliance with the BLM's ARMPAs. Table 4-145 presents a crosswalk of the Wyoming ARMPA stipulations, guidance, and practices.

Table 4-145
Crosswalk of Project Design Features and Bureau of Land Management Required Mitigation with Wyoming ARMPA Management Direction

Project Design Feature or Mitigation Measure	Wyoming ARMPA Management Direction
Design Feature 1 (preconstruciton surveys for sensitive species)	ARMPA Appendix F on mapping habitat and Appendix M on identifying preconstruction habitat condition for reclamation follow-up
Design Feature 2 (wildlife and livestock – disturbance and harassment)	ARMPA addressing avoiding disturbance and harassment and Appendix F to meet habitat management objectives
Design Feature 3 (wildlife and livestock – vehicle collisions)	ARMPA avoiding and minimizing vehicle and road conflicts and Appendix F to meet habitat management objectives
Agency-Required Mitigation Measure 1 (sensitive resource avoidance)	Appendix B stipulations include: the Project and cumulative value of existing surface development disturbance must not exceed 5 percent of available PHMA in an area (refer to Section 4.4.24.3.2.1 for greater sage-grouse cumulative effects analysis); NSO or disturbance within 0.6 mile or 0.6-mile radius of occupied leks in PHMA, 0.25 mile or 0.25-mile radius of occupied leks in GHMA; and NSO or disturbance seasonal restrictions in PHMA and GHMA between March 15 to June 30. New Project noise levels, either individual or cumulative, should not exceed 10 dBA (as measured by L_{50}) above baseline noise at the perimeter of the lek from 6:00 p.m. to 8:00 a.m. during the breeding season (March 1 to May 15).
Agency-Required Mitigation Measure 7 (seasonal restrictions)	Appendix B NSO or disturbance seasonal restrictions in PHMA and GHMA between March 15 to June 30

Table 4-145
Crosswalk of Project Design Features and Bureau of Land Management Required Mitigation with Wyoming ARMPA Management Direction

Project Design Feature or Mitigation Measure	Wyoming ARMPA Management Direction
Agency-Required Mitigation Measure 8 (interim or intense reclamation)	Appendix M details reclamation specifications and BMPs required to ensure proper reclamation of disturbed habitat during construction, reclamation, and operations. Annual monitoring of disturbed areas in PHMA would be required until the final reclamation criteria were achieved as outlined in Appendix M.
Additional Appropriate Mitigation	Refer to Section 4.5.

SOURCE: BLM 2015d; RMP Main Body and Record of Decision
Appendix B: Fluid Mineral Stipulations – includes stipulations on density disturbance in PHMA, occupied leks in PHMA and GHMA, and seasonal habitats in PHMA and GHMA.
Appendix C: Required Design Features – includes recommended BMPs on siting right-of-way, roads, and other ancillary facilities; construction and operations; and noise.
Appendix D: The Greater Sage-Grouse Habitat Management Strategy – provides specific goals, objectives, management actions, and required design features as a framework for implementation by BLM field offices.
Appendix F: Mitigation Guidelines for Surface Disturbing Activities in Wyoming – includes surface use restrictions that are referenced in this section.
Appendix M: Reclamation Plan – details the specifications and BMPs required to ensure proper reclamation of disturbed habitat during construction, reclamation, and operations.

4.3.23.5.5.1 Potential Effects

Without mitigation, the Project would result in direct and indirect effects on greater sage-grouse. In general, potential direct and indirect effects include:

- Permanent and temporary habitat loss
- Displacement, including:
  - Abandonment of occupied leks
  - Abandonment of seasonal habitat, including wintering, nesting, and brooding habitats
  - Abandonment and avoidance of PHMA or GHMA
- Disruption of breeding behaviors, including lek attendance due to noise or nearby activities
- Loss of habitat function from cumulative development density
- Mortality of adult birds, nests, eggs, or young

MV-15 displays PHMA, GHMA, and sage-grouse leks potentially affected by the alternative routes. The results of the impact analysis are presented in Table 4-146.

4.3.23.5.5.2 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment will remain as it presently exists.

4.3.23.5.5.3 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant

Potential impacts on greater sage-grouse would be the same as those discussed below for the Segment 1 pipeline alternative routes. In addition, impacts from noise associated with the construction and operation of the Riley Ridge Sweetening Plant could affect occupied leks because the proposed Riley Ridge Sweetening Plant is located on the western edge of GHMA with occupied leks. For the construction of the

Riley Ridge Sweetening Plant, the combined L_{50} noise of construction and drilling equipment is predicted to exceed the L_{90} ambient plus 10 dBA for a 3.8-mile radius. The West Buckhorn Draw lek is the closest greater sage-grouse lek in the GHMA area approximately 2.1 miles northeast of the plant. Although this lek is beyond the 2-mile noise impact buffer identified in WGFD recommendations, the noise threshold will be exceeded. However, the proposed 24-month construction period of the Riley Ridge Sweetening Plant will be subject to seasonal restrictions, as described in Table 4-139.

Once construction is complete, the operational noise of the Project will consist of the Riley Ridge Sweetening Plant and the two gas injection wells. Operations are predicted to be clearly audible within a 0.9-mile radius of the plant but occasionally audible at greater distances when not masked by other manmade or natural noise sources. At the Buckhorn Draw lek, 2.1 miles from the plant, L_{50} operational noise is predicted to be less than the ambient plus 10 dBA threshhold. Refer to Section 4.3.9 for explanation of the noise analysis and results.

Injection Wells

Potential impacts on greater sage-grouse would be the same as those discussed above for the Riley Ridge Sweetening Plant.

Segment 1 Pipeline Alternative Routes

Based on the impact assessment criteria used in this analysis (Table 4-138), all alternative routes in Segment 1 would have low residual impacts on greater sage-grouse populations (MV-15, Table 4-146). Although Alternative 1C: Figure Four crosses the most greater sage-grouse habitat, higher impacts would be expected from Alternative 1A: Proposed Action and 1A Variation: Dry Basin Draw from crossing an NSO area (Table 4-146).

Segment 1 alternative routes are located entirely in GHMA, and no PHMA or SFA would be crossed. Alternatives 1A: Proposed Action and 1A Variation: Dry Basin Draw cross NSO areas in GHMA (i.e., areas within 0.25 mile of leks outside of PHMA), but the Applicant has committed to using HDD or micro-siting in NSO areas to comply with the Wyoming ARMPA. All alternative routes are located within 4 miles of 11 to 12 leks, and none of the alternative routes are within 4 miles of PHMA (Table 3-170). Since none of the alternative routes are in PHMA, all alternative routes would be in compliance with the 5 percent disturbance cap included in the Wyoming ARMPA. A summary of greater sage-grouse habitat affected by each alternative route in Segment 1 is presented in Table 4-147.

The Segment 1 alternative routes will result in increased habitat disturbance for greater sage-grouse. While the Project will ultimately be a buried pipeline right-of-way, subject to reclamation, removal of the existing vegetation would contribute to temporary habitat loss and, possibly, habitat fragmentation.

Table 4-146
Greater Sage-Grouse Residual Impacts

Alternative	Total Miles	Residual Impacts (miles)[1]												
		Priority Habitat Management Areas (PHMA)		General Habitat Management Areas (GHMA)		Sagebrush Focal Areas – South Central Wyoming		No Surface Occupancy Areas for Leks in PHMA		No Surface Occupancy Areas for Leks in GHMA		Overall Residual Impacts		
		None	Moderate	None	Low	None	Moderate	None	Low	None	Low	None	Low	Moderate
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant														
1A: Proposed Action	30.4	30.4	0.0	0.0	30.4	30.4	0.0	30.4	0.0	30.0	0.4	0.0	30.4	0.0
1A Variation: Dry Basin Draw	30.7	30.7	0.0	0.0	30.7	30.7	0.0	30.7	0.0	30.3	0.4	0.0	30.7	0.0
1B: Dry Piney	34.5	34.5	0.0	0	34.5	34.5	0.0	34.5	0.0	34.5	0.0	0.0	34.5	0.0
1C: Figure Four	38.5	38.5	0.0	0	38.5	38.5	0.0	38.5	0.0	38.5	0.0	0.0	38.5	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect														
2A: Proposed Action	129.1	45.4	83.7	0.0	129.1	94.0	35.1	124.5	4.6	128.3	0.8	0.0	45.4	83.7
2B: Southern Route	136.2	58.1	78.1	0.0	136.2	97.9	38.3	133.9	2.3	135.9	0.3	0.0	58.1	78.1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect														
3A: Proposed Action	83.2	37.5	45.7	0.0	83.2	83.2	0.0	82.3	0.9	83.2	0.0	0.0	37.5	45.7
3B: Lost Creek to Lost Cabin	73.0	34.9	38.1	0.0	73.0	73.0	0.0	73.0	0.0	73.0	0.0	0.0	34.9	38.1
3C: Lost Creek to Highway 20/26	101.4	51.5	49.9	0.0	101.4	101.4	0.0	101.4	0.0	101.4	0.0	0.0	51.5	49.9

NOTE: [1]With the implementation of agency-required mitigation measures identified for this resource, no high impacts would be anticipated.

Table 4-147 Summary of Segment 1 Impacts on Greater Sage-Grouse	
Alternative Route	**Greater Sage-Grouse Impacts**
1A: Proposed Action	Entire route crosses GHMA, no PHMA or SFA crossed. Crosses within 4 miles of 12 occupied leks, including one occupied lek within 0.25 mile in GHMA. No PHMA within 4 miles. Disturbance cap threshold not applicable.
1A Variation: Dry Basin Draw	Entire route crosses GHMA, no PHMA or SFA crossed. Crosses within 4 miles of 12 occupied leks, including one occupied lek within 0.25 mile in GHMA. No PHMA within 4 miles. Disturbance cap threshold not applicable.
1B: Dry Piney	Entire route crosses GHMA, no PHMA or SFA crossed. Crosses within 4 miles of 11 occupied leks but no occupied leks within 0.25 mile in GHMA. No PHMA within 4 miles. Disturbance cap threshold not applicable.
1C: Figure Four	Entire route crosses GHMA, no PHMA or SFA crossed. Crosses within 4 miles of 12 occupied leks but no occupied leks within 0.25 mile in GHMA. No PHMA within 4 miles. Disturbance cap threshold not applicable.

Additionally, mortality could result from collisions with and destruction of nests by construction and maintenance vehicles.

The GHMA crossed by the Segment 1 alternative routes would be subject to the following mitigation measures to avoid moderate or high impacts. In accordance with the Wyoming ARMPA, the following mitigation will be implemented to avoid, minimize, and compensate for impacts in GHMA resulting from the Segment 1 alternative routes:

- Preconstruction surveys will determine leks activity for leks within 0.25 mile of the centerline.
- Where the centerline crosses within 0.25 mile of occupied leks in GHMA, micro-siting or HDD would be required, regardless of the occurrence of lek activity, as determined by preconstruction surveys.
- No construction or activity will occur in GHMA between March 15 and June 30 to avoid impacts on breeding, nesting, and early brooding habitat or on habitat use. If wintering habitat is identified by the BLM as potentially affected by the Project, timing restrictions will be determined on a case-by-case basis.
- New project noise levels associated with the Riley Ridge Sweetening Plant construction, either individual or cumulative, should not exceed 10 dBA (as measured by L_{50}) above baseline noise at the perimeter of the lek from 6:00 pm to 8:00 am during the breeding season (March 1 to May 15).
- Personnel and contractors will adhere to a 35-mph speed limit in the Project area to ensure safe and efficient traffic flow and to reduce collisions, disturbance, noise, and airborne dust.

Avoidance of areas within 0.25 mile of occupied leks and application of seasonal restrictions are critical mitigation measures to avoid high residual impacts on greater sage-grouse in Segment 1. Without seasonal restrictions, the Project could result in high impacts, including habitat loss, displacement, and mortality (Holleran 2005). From March 15 to June 30, greater sage-grouse use important seasonal habitats within the GHMA for breeding, nesting, and brooding young. Construction outside of the seasonal restriction period will result in temporary habitat disturbance while avoiding the time period when greater sage-grouse are most vulnerable.

Greater sage-grouse lek locations are attended yearly and consistently through time. Leks may be occupied for several years, abandoned, and reoccupied again years later (Connelly et al. 2004). Lek sites are selected for their location, characteristics, and other factors that make them best suited year after year

(Harrell 2008). Surface disturbance or occupancy from construction activities within 0.25 mile of occupied leks could affect the lek by altering the factors the birds find favorable for using the site as a lek. The lek could subsequently be abandoned and never occupied again as a result of construction-related changes (Holleran 2005). Implementing avoidance of these leks through micro-siting or HDD will enable the continued use of occupied leks after completion of Project construction.

Surface vegetative cover in GHMA will be subject to reclamation to limit habitat loss, but, nonetheless, the Project will result in habitat loss for several years following construction. Greater sage-grouse habitat use declines where sagebrush land cover has been converted to other uses or is subject to minimal reclamation (Knick et al. 2013). Without reclamation that includes soil management and reseeding, weedy and less desirable vegetation may re-establish, making for poor habitat and cover. Reclamation will minimize weedy and invasive species establishment and promote the re-establishment of native sagebrush species for greater sage-grouse habitat.

In addition to avoidance of NSO areas, seasonal restrictions, and reclamation, additional appropriate mitigation may be required to achieve a net conservation gain for greater sage-grouse, as required by the Wyoming ARMPA. Refer to Appendix C for additional discussion of additional mitigation requirements.

Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Based on the impact assessment criteria used in this analysis (Table 4-138), both alternative routes in Segment 2 would have moderate residual impacts on greater sage-grouse populations (MV-15, Table 4-142). Both alternative routes in Segment 2 cross GHMA, PHMA, and SFA (Table 4-142). Both alternative routes also cross NSO areas in PHMA (i.e., areas within 0.6 mile of leks in PHMA) and GHMA (i.e., areas within 0.25 mile of leks outside of PHMA) (Table 4-148), but the Applicant has committed to using HDD or micro-siting in NSO areas to comply with the Wyoming ARMPA.

Alternative 2A: Proposed Action crosses within 4 miles of 4 more leks than Alternative 2B: Southern Route (Table 3-171) and would result in 6 additional miles of moderate residual impacts due to crossing 6 additional miles of PHMA (Table 4-142). A summary of greater sage-grouse habitat affected by each alternative route in Segment 2 is presented in Table 4-148.

Table 4-148
Summary of Segment 2 Impacts on Greater Sage-Grouse

Alternative Route	Greater Sage-Grouse Impacts
2A: Proposed Action	Entire route crosses GHMA or PHMA and SFA. Crosses within 4 miles of 37 occupied leks, including 2 occupied leks within 0.6 mile in PHMA, and 1 occupied lek within 0.25 mile in GHMA. Cumulative disturbance using the DDCT would not exceed the 5 percent disturbance cap.
2B: Southern Route	Entire route crosses GHMA or PHMA and SFA. Crosses within 4 miles of 33 occupied leks, including 1 occupied lek within 0.6 mile in PHMA. No occupied leks within 0.25 mile in GHMA. Cumulative disturbance using the DDCT would not exceed 5 percent.

The large contiguous habitat block of PHMA, GHMA, and SFA crossed by both Segment 2 alternative routes is identified as important habitat for maintaining Wyoming's sage-grouse populations (Connelly et al. 2004). The habitat block has 81 to 100 percent sagebrush cover and is the portion of the Wyoming Basin population with the highest sagebrush species diversity. The region has one of the highest greater sage-grouse population densities in the state.

For both alternatives routes, disturbance in PHMAs would not exceed the 5 percent disturbance cap included in the Wyoming ARMPA (refer to Section 4.4.24.3 for further discussion on cumulative disturbance on greater sage-grouse habitat).

The Segment 2 alternative routes will result in increased habitat disturbance for greater sage-grouse. While the Project will ultimately be a buried pipeline right-of-way, subject to reclamation, removal of the existing vegetation would contribute to habitat loss and possibly habitat fragmentation. Additionally, mortality could result from collisions with and destruction of nests by construction and maintenance vehicles.

Greater sage-grouse habitat crossed by the Segment 2 alternative routes would be subject to the following mitigation measures to avoid high impacts. In accordance with the Wyoming ARMPA, the following mitigation will be implemented to avoid, minimize, and compensate for impacts in GHMA, PHMA, and SFA resulting from the Segment 2 alternative routes:

- Preconstruction surveys will determine activity of leks where the centerline crosses within 0.6 mile of occupied leks in PHMA, and 0.25 mile of occupied leks in GHMA.
- No construction or activity will occur in GHMA or PHMA between March 15 and June 30 to avoid impacts on breeding, nesting, and early brooding habitat or on habitat use. If wintering habitat is identified by the BLM as potentially affected by the Project, timing restrictions will be determined on a case-by-case basis.
- Where the centerline crosses within 0.6 mile of occupied leks in PHMA, and 0.25 mile of occupied leks in GHMA, micro-siting or HDD would be required, regardless of the occurrence of lek activity, as determined by preconstruction surveys.
- Reclamation of sage-grouse habitat will follow the guidelines in Appendix M (BLM 2015d) of the ARMPA to restore disturbed PHMA and SFA to the preconstruction condition through construction soil management and stabilization, reseeding, monitoring, and maintenance (Agency-Required Mitigation Measure 8). Maintenance could include weed management, mowing, and reseeding coordinated with the approving manager.
- Personnel and contractors will adhere to a 35 mph speed limit in the Project area to ensure safe and efficient traffic flow and to reduce collisions, disturbance, noise, and airborne dust.

The residual impacts and consequences of mitigation for Segment 2 routes will be the same as described for Segment 1. Lek activity will be determined with preconstruction surveys followed by avoidance, seasonal restrictions, reclamation, and additional appropriate mitigation.

Impacts associated with the large habitat block of PHMA, GHMA, and SFA crossed by the Segment 2 alternative routes merit discussion. Due to the importance of this habitat block for greater sage-grouse population viability, without mitigation, impacts could extend beyond habitat loss. Disturbances occurring from March 15 to June 30 could result in lek and nest abandonment, avoidance, and increased predation that can have a wider effect on populations (Sandercock et al. 2011). Avoiding disturbances within sensitive lek areas and implementing seasonal restrictions will limit impacts from temporary habitat loss.

In addition to avoidance of NSO areas, seasonal restrictions, and reclamation, additional appropriate mitigation may be required to achieve a net conservation gain for greater sage-grouse, as required by the Wyoming ARMPA. Refer to Appendix C for additional discussion of additional mitigation requirements.

Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Based on the impact assessment criteria used in this analysis (Table 4-138), all alternative routes in Segment 3 would have moderate residual impacts on greater sage-grouse populations (MV-15, Table 4-149). All alternative routes in Segment 3 cross GHMA and PHMA (Table 4-142). Neither SFA nor NSO areas in GHMA (i.e., areas within 0.25 mile of leks outside of PHMA) are crossed by any alternative route in Segment 3. Only Alternative 3A: Proposed Action crosses NSO areas in PHMA

(i.e., areas within 0.6 mile of leks in PHMA), but the Applicant has committed to using HDD or micro-siting in NSO areas to comply with the Wyoming ARMPA. Alternative 3A: Proposed Action crosses within 4 miles of 7 to 10 more leks than the other two alternative routes (Table 3-171). A summary of greater sage-grouse habitat affected by each alternative route in Segment 2 is presented in Table 4-148. It is notable that Alternative 3C: Lost Creek to Highway 20/26 is colocated with the existing highway alignment.

Table 4-149
Summary of Segment 3 Impacts on Greater Sage-Grouse

Alternative Route	Greater Sage-Grouse Impacts
3A: Proposed Action	Entire route crosses GHMA or PHMA. Crosses within 4 miles of 24 occupied leks, including 1 occupied lek within 0.6 mile in PHMA. Cumulative disturbance using the DDCT would not exceed the 5 percent disturbance cap.
3B: Lost Creek to Lost Cabin	Entire route crosses GHMA or PHMA. Crosses within 4 miles of 17 occupied leks, including 1 occupied lek within 0.6 mile in PHMA. Cumulative disturbance using the DDCT would not exceed the 5 percent disturbance cap.
3C: Lost Creek to Highway 20/26	Entire route crosses GHMA or PHMA. Crosses within 4 miles of 14 occupied leks, including 1 occupied lek within 0.6 mile in PHMA. Cumulative disturbance using the DDCT would not exceed the 5 percent disturbance cap.

For alternatives routes, disturbance in PHMAs would not exceed the 5 percent disturbance cap included in the Wyoming ARMPA (refer to Section 4.4.24.3 for further discussion on cumulative disturbance on greater sage-grouse habitat).

The Segment 3 alternative routes will result in increased habitat disturbance for greater sage-grouse. While the Project will ultimately be a buried pipeline right-of-way, subject to reclamation, removal of the existing vegetation would contribute to habitat loss and possibly habitat fragmentation. Additionally, mortality could result from collisions with and destruction of nests by construction and maintenance vehicles.

Greater sage-grouse habitat crossed by the Segment 3 alternative routes would be subject to the following mitigation measures to avoid high impacts. In accordance with the Wyoming ARMPA, the following mitigation will be implemented to avoid, minimize, and compensate for impacts in GHMA and PHMA resulting from the Segment 3 alternative routes:

- Preconstruction surveys will determine activity of leks where the centerline crosses within 0.6 mile of occupied leks in PHMA and 0.25 mile of occupied leks in GHMA.
- No construction or activity will occur in GHMA or PHMA between March 15 and June 30 to avoid impacts on breeding, nesting, and early brooding habitat or on habitat use. If wintering habitat is identified by the BLM as potentially affected by the Project, timing restrictions will be determined case by case.
- Where the centerline crosses within 0.6 mile of occupied leks in PHMA, and 0.25 mile of occupied leks in GHMA, micro-siting or HDD would be required, regardless of the occurrence of lek activity in the year of construction, as determined by preconstruction surveys.
- Reclamation will follow the guidelines in Appendix M (BLM 2015d) to restore disturbed PHMA and GHMA to the preconstruction condition through construction soil management and stabilization, reseeding, monitoring, and maintenance (Agency-Required Mitigation Measure 8). Maintenance could include weed management, mowing, and reseeding coordinated with the approving manager.
- Personnel and contractors will adhere to a 35-mph speed limit in the Project area to ensure safe and efficient traffic flow and to reduce collisions, disturbance, noise, and airborne dust.

The residual impacts and consequences of mitigation for Segment 3 routes will be the same as described for Segment 1. Lek activity will be determined with preconstruction surveys followed by avoidance, seasonal restrictions, reclamation, and additional appropriate mitigation.

Impacts associated with the two habitat blocks of PHMA and GHMA crossed by the Segment 3 alternative routes merit discussion. Due to the importance of these habitats for greater sage-grouse population viability, without mitigation, impacts could extend beyond habitat loss. Disturbances during the March 15 to June 30 period can result in lek and nest abandonment, avoidance, and increased predation that can have a wider effect on populations (Sandercock et al. 2011). Avoiding disturbances within sensitive lek areas and implementing seasonal restrictions will limit impacts from temporary habitat loss.

In addition to avoidance of NSO areas, seasonal restrictions, and reclamation, additional appropriate mitigation may be required to achieve a net conservation gain for greater sage-grouse, as required by the Wyoming ARMPA. Refer to Appendix C for additional discussion of additional mitigation requirements.

230-Kilovolt Transmission Line

The 230kV transmission line is located entirely in GHMA. Construction of the 230kV line will be subject to the same mitigation requirements as described above for GHMA and for leks in GHMA. Raptor deterrents will also be installed on the transmission towers to deter raptor perching, thus minimizing predation risks to greater sage-grouse.

To minimize potential impacts on greater sage-grouse, the Project design and construction will follow PacifiCorp's Avian-Safe Design Standards for substations and power lines, which adheres to *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (Avian Power Line Interaction Committee 2006) and PacifiCorp's Avian Protection Plan(s). Additional appropriate mitigation may be required to achieve a net conservation gain for greater sage-grouse, as required by the Wyoming ARMPA. Refer to Appendix C for additional discussion of additional mitigation requirements.

Mainline Valves and Distribution Lines

Along with fences enclosing the valves, 24 above-ground MLVs, would be installed at regular intervals along the pipeline and approximately 25 distribution lines would be installed to power the MLVs. Refer to Chapter 2 (Section 2.1.1.1) for descriptions of the MLVs and distribution lines, including locations of the MLVs for the Proposed Action; the locations of the distribution lines have yet to be determined.

The MLVs and distribution lines will result in increased disturbance for greater sage-grouse. While much of the disturbance from construction is only temporary, the installation of MLVs would result in permanent habitat loss. Also, the MLVs, enclosure fences, and distribution line towers could be used as perching substrates by raptors and could result in increased raptor predation on greater sage-grouse. The increase in potential raptor predation risk created by the valves and enclosure fences would be expected to be relatively small compared to the towers, as predation rate and hunting success are lower at shorter perch heights (Andersson et al. 2009). Raptor deterrents will be installed on the distribution line towers to deter raptor perching, thus minimizing predation risks to greater sage-grouse.

Construction of the MLVs and distribution lines will be subject to the same mitigation requirements as described for the alternative routes. Also, distribution lines to power MLVs will not be sited in PHMA for greater sage-grouse; rather, MLVs in PHMA would be powered via solar power. Thus, no direct or indirect impacts from overhead distribution lines on PHMA would occur.

To minimize potential impacts from the distribution lines on greater sage-grouse, the Project design and construction will follow PacifiCorp's 's Avian-Safe Design Standards for substations and power lines,

which adheres to *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (Avian Power Line Interaction Committee 2006) and PacifiCorp's Avian Protection Plan(s).

4.3.23.5.6 Wyoming Pocket Gopher

4.3.23.5.6.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and the environment will remain as it presently exists.

4.3.23.5.6.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction and Injection Wells

The proposed Riley Ridge Sweetening Plant and injections wells are not located near any known Wyoming pocket gopher occurrences or in WYNDD-mapped habitat. Potential impacts on Wyoming pocket gopher would be the same as those discussed below for the Segment 1 pipeline alternative routes.

Segment 1 Pipeline Alternative Routes

None of the alternative routes in Segment 1 cross any known Wyoming pocket gopher occurrences or WYNDD mapped habitat. If Wyoming pocket gopher is confirmed to occur along any of the alternative routes in Segment 1, residual impacts on Wyoming pocket gopher would be low for all alternative routes based on the impact criteria used in this analysis (Table 4-138).

Design Feature 1 (preconstruction surveys for sensitive species) would be implemented and if occurrences or habitat is determined to exist in the right-of-way, then coordination with the appropriate land-management agency will be conducted to determine whether mitigation measures could be implemented to reduce potential effects on the Wyoming pocket gopher. Without mitigation, direct effects could include habitat loss and temporary displacement due to noise and activity associated with construction, as well as direct mortality as a result of crushing of burrows by Project equipment or collisions with moving construction equipment and vehicles, and indirect effects could include decreased population level, loss of genetic integrity, and habitat fragmentation.

Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Both of the alternative routes in Segment 2 cross similar amounts of WYNDD mapped habitat for Wyoming pocket gopher (Table 3-173), although the species is not known to occur in the Project area. If Wyoming pocket gopher is confirmed to occur in the Project area, residual impacts on Wyoming pocket gopher would be low for both alternative routes based on the impact criteria used in this analysis (Table 4-138).

Residual impacts on Wyoming pocket gopher would be anticipated to be low for both alternative routes as a result of implementation of Design Feature 1 (preconstruciton surveys for sensitive species) to identify habitat to avoid. If occurrences or habitat are confirmed to exist in the right-of-way, then coordination with the appropriate land-management agency will be conducted to determine whether mitigation measures could be implemented to reduce potential effects on Wyoming pocket gopher. Without mitigation, direct effects could include habitat loss and temporary displacement due to noise and activity associated with construction, as well as direct mortality as a result of crushing of burrows by Project equipment or collisions with moving construction equipment and vehicles, and indirect effects could include decreased population level, loss of genetic integrity, and habitat fragmentation.

Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Interconnect

All of the alternative routes in Segment 3 cross the same amount of WYNDD mapped habitat for Wyoming pocket gopher (Table 3-173), although the species is not known to occur in the Project area. If Wyoming pocket gopher is confirmed to occur in the Project area, residual impacts on Wyoming pocket gopher would be low for all three alternative routes based on the impact criteria used in this analysis (Table 4-138).

Residual impacts on Wyoming pocket gopher would be anticipated to be low for all alternative routes as a result of implementation of Design Feature 1 (preconstruciton surveys for sensitive species) to identify habitat to avoid. If occurrences or habitat are confirmed to exist in the right-of-way, then coordination with the appropriate land-management agency will be conducted to determine whether mitigation measures could be implemented to reduce potential effects on Wyoming pocket gopher. Without mitigation, direct effects could include habitat loss and temporary displacement due to noise and activity associated with construction, as well as direct mortality as a result of crushing of burrows by Project equipment or collisions with moving construction equipment and vehicles, and indirect effects could include decreased population level, loss of genetic integrity, and habitat fragmentation.

230-Kilovolt Transmission Line

The proposed 230kV transmission line could potentially affect Wyoming pocket gopher habitat; however, Wyoming pocket gophers are not known to occur in the 230kV transmission line study area. Implementation of Design Feature 1 to conduct preconstruction surveys would be implemented and if occurrences or habitat is determined to exist in the right-of-way, then coordination with the appropriate land-management agency would be conducted to determine if mitigation measures should be implemented to reduce potential effects on the Wyoming pocket gopher.

Mainline Valve Distribution Lines

The locations of the approximately 24 distribution lines that would be required to power the MLVs along the pipeline are not known. The transmission line tower spacing and siting would be refined to avoid direct impacts on Wyoming pocket gopher. Implementation of Design Feature 1 to conduct preconstruction surveys would be implemented and if occurrences or habitat is determined to exist in the right-of-way, then coordination with the appropriate land-management agency would be conducted to determine if mitigation measures should be implemented to reduce potential effects on the Wyoming pocket gopher. Residual direct impacts on Wyoming pocket gopher could be minimized through burial of the distribution line or use of solar power at the MLV.

4.3.23.5.7 White-Tailed Prairie Dog

4.3.23.5.7.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and habitat for the white-tailed prairie dog will remain as it presently exists.

4.3.23.5.7.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction and Injection Wells

The proposed Riley Ridge Sweetening Plant and injection wells are not in WYNDD-mapped habitat for white-tailed prairie dog and the species is not known to occur in the Project area. Potential impacts on white-tailed prairie dog would be the same as those discussed below for the Segment 1 pipeline alternative routes.

Segment 1 Pipeline Alternative Routes

All of the alternative routes in Segment 1 cross WYNDD mapped habitat for white-tailed prairie dog (Table 3-173) although the species is not known to occur in the Project area. If white-tailed prairie dog is confirmed to occur in the Project area, residual impacts on white-tailed prairie dog would be low for all three alternative routes based on the impact criteria used in this analysis (Table 4-138).

Residual impacts on white-tailed prairie dog would be anticipated to be low for all alternative routes as a result of implementation of Design Feature 1 (preconstruciton surveys for sensitive species) to identify habitat to avoid. If occurrences or habitat are confirmed to exist in the right-of-way, then coordination with the appropriate land-management agency will be conducted to determine whether mitigation measures could be implemented to reduce potential effects on white-tailed prairie dog. Without mitigation, direct effects could include habitat loss and temporary displacement due to noise and activity associated with construction, as well as direct mortality as a result of crushing of burrows by Project equipment or collisions with moving construction equipment and vehicles, and indirect effects could include decreased population level, loss of genetic integrity, and habitat fragmentation.

Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Both of the alternative routes in Segment 2 cross WYNDD mapped habitat for white-tailed prairie dog (Table 3-173) and is known to occur in the Project area. Residual impacts on white-tailed prairie dog would be low for both alternative routes based on the impact criteria used in this analysis (Table 4-138).

Residual impacts on white-tailed prairie dog would be anticipated to be low for both alternative routes as a result of implementation of Design Feature 1 (preconstruciton surveys for sensitive species) to identify habitat to avoid. If occurrences or habitat are confirmed to exist in the right-of-way, then coordination with the appropriate land-management agency will be conducted to determine whether mitigation measures could be implemented to reduce potential effects on white-tailed prairie dog. Without mitigation, direct effects could include habitat loss and temporary displacement due to noise and activity associated with construction, as well as direct mortality as a result of crushing of burrows by Project equipment or collisions with moving construction equipment and vehicles, and indirect effects could include decreased population level, loss of genetic integrity, and habitat fragmentation.

Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Interconnect

All of the alternative routes in Segment 3 cross WYNDD mapped habitat for white-tailed prairie dog (Table 3-173) although the species is not known to occur in the Project area. If white-tailed prairie dog is confirmed to occur in the Project area, residual impacts on white-tailed prairie dog would be low for all four alternative routes based on the impact criteria used in this analysis (Table 4-138).

Residual impacts on white-tailed prairie dog would be anticipated to be low for all alternative routes as a result of implementation of Design Feature 1 (preconstruciton surveys for sensitive species) to identify habitat to avoid. If occurrences or habitat are confirmed to exist in the right-of-way, then coordination with the appropriate land-management agency will be conducted to determine whether mitigation measures could be implemented to reduce potential effects on white-tailed prairie dog. Without mitigation, direct effects could include habitat loss and temporary displacement due to noise and activity associated with construction, as well as direct mortality as a result of crushing of burrows by Project equipment or collisions with moving construction equipment and vehicles, and indirect effects could include decreased population level, loss of genetic integrity, and habitat fragmentation.

230-Kilovolt Transmission Line

The proposed 230kV transmission line could potentially affect white-tailed prairie dog habitat; however, white-tailed prairie dogs are not known to occur in the 230kV transmission line study area.

Implementation of Design Feature 1 (preconstruciton surveys for sensitive species) to identify habitat to avoid spatial restrictions would minimize moderate or high impacts on the white-tailed prairie dog. Spatial restrictions or other measures would be determined on a case-by-case basis. Additional mitigation will include the installations of perch deterrents to deter and preclude raptors from using the transmission facilities as artificial perches. Additional mitigation could include burial of the transmission lines or MLV solar power instead. Without mitigation, direct effects could include habitat loss and displacement, as well as direct mortality, and indirect effects could include habitat fragmentation.

Mainline Valve Distribution Lines

The locations of the approximately 24 distribution lines that would be required to power the MLVs along the pipeline are not known. The transmission line tower spacing and siting would be refined to avoid direct impacts on white-tailed prairie dog. Implementation of Design Feature 1 (preconstruciton surveys for sensitive species) to identify habitat to avoid would minimize impacts on the white-tailed prairie dog. Additional mitigation will include the installations of perch deterrents to deter and preclude raptors from using the transmission facilities as artificial perches. Residual direct impacts on white-tailed prairie dog could be minimized through burial of the distribution line or using solar power at the MLV. Without mitigation, direct effects could include habitat loss and displacement, as well as direct mortality, and indirect effects could include habitat fragmentation.

4.3.23.5.8 Pygmy Rabbit

4.3.23.5.8.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and habitat for the pygmy rabbit would remain as it presently exists.

4.3.23.5.8.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction

The proposed Riley Ridge Sweetening Plant and injection wells are in WYNDD-mapped habitat for pygmy rabbit. Potential impacts on pygmy rabbit would be the same as those discussed below for the Segment 1 pipeline alternative routes.

Segment 1 Pipeline Alternative Routes

Based on the impact assessment criteria used in this analysis (Table 4-138 all alternative routes in Segment 1 would have low residual impacts on pygmy rabbit. All of the alternative routes in Segment 1 cross WYNDD mapped habitat for pygmy rabbit (Table 3-173), and the species is known to occur in proximity to all alternative routes in Segment 1.

Residual impacts on pygmy rabbit would be anticipated to be low for all alternative routes as a result of implementing of Design Feature 1 (preconstruciton surveys for sensitive species) to identify habitat to avoid. Spatial restrictions for pygmy rabbit habitat are determined on a case-by-case basis (Table 4-139). If occurrences or habitat for pygmy rabbit are confirmed to exist in the right-of-way, then coordination with the appropriate land-management agency will be conducted to determine whether additional Project selected mitigation measures could be implemented to reduce potential effects on the pygmy rabbit. Without mitigation, direct effects could include habitat loss and temporary displacement due to noise and activity associated with construction, as well as direct mortality as a result of crushing of burrows by Project equipment or collisions with moving construction equipment and vehicles, and indirect effects could include decreased population level, loss of genetic integrity, and habitat fragmentation effects.

Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Based on the impact assessment criteria used in this analysis (Table 4-138), both alternative routes in Segment 2 would have low residual impacts on pygmy rabbit. All of the alternative routes in Segment 2 cross WYNDD mapped habitat for pygmy rabbit (Table 3-173), and the species is known to occur in proximity to both alternative routes in Segment 2. In addition, the BLM recently completed an unpublished survey on a known pygmy rabbit population along the western portion of the 2A: Proposed Action route.

Residual impacts on pygmy rabbit would be anticipated to be low for all alternative routes as a result of implementation of Design Feature 1 (preconstruciton surveys for sensitive species) to identify habitat to avoid. Spatial restrictions for pygmy rabbit habitat are determined on a case-by-case basis (Table 4-139). If occurrences or habitat for pygmy rabbit is confirmed to exist in the right-of-way, then coordination with the appropriate land-management agency will be conducted to determine whether additional Project selected mitigation measures could be implemented to reduce potential effects on the pygmy rabbit. Without mitigation, direct effects could include habitat loss and temporary displacement due to noise and activity associated with construction, as well as direct mortality as a result of crushing of burrows by Project equipment or collisions with moving construction equipment and vehicles, and indirect effects could include decreased population level, loss of genetic integrity, and habitat fragmentation effects.

Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Interconnect

Based on the impact assessment criteria used in this analysis (Table 4-138), all alternative routes in Segment 3 would have low residual impacts on pygmy rabbit. All of the alternative routes in Segment 3 cross WYNDD mapped habitat for pygmy rabbit (Table 3-173), and the species is known to occur in proximity to all alternative routes in Segment 3.

Residual impacts on pygmy rabbit would be anticipated to be low for all alternative routes as a result of implementation of Design Feature 1 (preconstruciton surveys for sensitive species) to identify habitat to avoid. Spatial restrictions for pygmy rabbit habitat are determined on a case-by-case basis (Table 4-139). If occurrences or habitat for pygmy rabbit is confirmed to exist in the right-of-way, then coordination with the appropriate land-management agency will be conducted to determine whether additional Project selected mitigation measures could be implemented to reduce potential effects on the pygmy rabbit. Without mitigation, direct effects could include habitat loss and temporary displacement due to noise and activity associated with construction, as well as direct mortality as a result of crushing of burrows by Project equipment or collisions with moving construction equipment and vehicles, and indirect effects could include decreased population level, loss of genetic integrity, and habitat fragmentation effects.

230-Kilovolt Transmission Line

The proposed 230kV transmission line could potentially affect pygmy rabbit. Agency-Required Mitigation Measure 1 (sensitive resource avoidance) and/or Agency-Required Mitigation Measure 8 (interim and intensive reclamation) would minimize potential moderate or high impacts on the pygmy rabbit. Spatial restrictions for pygmy rabbit habitat are determined on a case-by-case basis (Table 4-139). Additional mitigation will include the installations of perch deterrents to deter and preclude raptors from using the transmission facilities as artificial perches. Additional mitigation could include burial of the transmission lines or MLV solar power instead. Without mitigation, direct effects could include habitat loss and displacement, as well as direct mortality, and indirect effects could include habitat fragmentation effects.

Mainline Valve Distribution Lines

The locations of the approximately 24 distribution lines that would be required to power the MLVs along the pipeline are not known. The transmission line tower spacing and siting would be refined to avoid

direct impacts on pygmy rabbit. Design Feature 1 (preconstruciton surveys for sensitive species) to determine where to implement Agency-Required Mitigation Measure 1 (sensitive resource avoidance) and/or Agency-Required Mitigation Measure 8 (interim and intensive reclamation) would minimize potential moderate or high impacts on the pygmy rabbit. Spatial restrictions for pygmy rabbit are determined on a case-by-case basis (Table 4-139). Residual direct impacts on pygmy rabbit could be minimized through burial of the distribution line or by using solar power at the MLV. Additional mitigation will include the installations of perch deterrents to deter and preclude raptors from using the transmission facilities as artificial perches. Without mitigation, direct effects could include habitat loss and displacement, as well as direct mortality, and indirect effects could include habitat fragmentation effects.

4.3.23.5.9 Fringed Myotis, Long-Eared Myotis, and Townsend's Big-Eared Bat

4.3.23.5.9.1 No Action Alternative

Under the No Action Alternative, the Applicant's right-of-way application to develop the Project under the Proposed Action would not be approved. The Project would not be developed and habitat for fringed myotis, long-eared myotis, and Townsend's big-eared bat would remain as it presently exists.

4.3.23.5.9.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Riley Ridge Sweetening Plant Construction

The proposed Riley Ridge Sweetening Plant and injection wells are not in WYNDD mapped habitat for long-eared myotis, fringed myotis, or Townsend's big-eared bat. Potential impacts on fringed myotis, long-eared myotis, and Townsend's big-eared bat would be the same as those discussed below for the Segment 1 pipeline alternative routes.

Segment 1 Pipeline Alternative Routes

All of the alternative routes in Segment 1 cross WYNDD mapped habitat for long-eared myotis (Table 3-173), but the species is not known to occur in the Project area. WYNDD mapped habitat for fringed myotis and Townsend's big-eared bat is not crossed in Segment 1. If fringed myotis, long-eared myotis, or Townsend's big-eared bat are confirmed to occur in the Project area, residual impacts on these species would be low for all alternative routes based on the impact criteria used in this analysis (Table 4-138).

Residual impacts on fringed myotis, long-eared myotis, and Townsend's big-eared would be anticipated to be low for all alternative routes as a result of implementation of protective measures, such as spatial restrictions. Spatial restrictions for these species are determined on a case-by-case basis (Table 4-139). If occurrences or habitat for fringed myotis, long-eared myotis, or Townsend's big-eared bat are confirmed to exist in the right-of-way, then coordination with the appropriate land-management agency will be conducted to determine whether additional Project selected mitigation measures could be implemented to reduce potential effects on these species. Without mitigation, direct effects could include habitat loss and temporary displacement due to noise and activity associated with construction, and indirect effects could include decreased population level, loss of genetic integrity, and habitat fragmentation.

Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Both of the alternative routes in Segment 2 cross WYNDD mapped habitat for long-eared myotis (Table 3-173), but the species is not known to occur in the Project area. WYNDD mapped habitat for fringed myotis and Townsend's big-eared bat is not crossed in Segment 2. If fringed myotis, long-eared myotis, or Townsend's big-eared bat are confirmed to occur in the Project area, residual impacts on these

species would be low for all alternative routes based on the impact criteria used in this analysis (Table 4-138).

Residual impacts on fringed myotis, long-eared myotis, and Townsend's big-eared would be anticipated to be low for both alternative routes as a result of implementation of protective measures, such as spatial restriction. Spatial restrictions for these species are determined on a case-by-case basis (Table 4-139). If occurrences or habitat for fringed myotis, long-eared myotis, or Townsend's big-eared bat are confirmed to exist in the right-of-way, then coordination with the appropriate land-management agency will be conducted to determine whether additional Project selected mitigation measures could be implemented to reduce potential effects on these species. Without mitigation, direct effects could include habitat loss and temporary displacement due to noise and activity associated with construction, and indirect effects could include decreased population level, loss of genetic integrity, and habitat fragmentation.

Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Interconnect

All of the alternative routes in Segment 3 cross WYNDD mapped habitat for long-eared myotis and Townsend's big-eared bat (Table 3-173), but these species are not known to occur in the Project area. WYNDD mapped habitat for fringed myotis is not crossed in Segment 3. If fringed myotis, long-eared myotis, or Townsend's big-eared bat are confirmed to occur in the Project area, residual impacts on these species would be low for all alternative routes based on the impact criteria used in this analysis (Table 4-138).

Residual impacts on fringed myotis, long-eared myotis, and Townsend's big-eared bat would be anticipated to be low for all alternative routes as a result of implementation of protective measures, such as spatial restrictions. Spatial restrictions for these species are determined on a case-by-case basis (Table 4-139). If occurrences or habitat for fringed myotis, long-eared myotis, and Townsend's big-eared are confirmed to exist in the right-of-way, then coordination with the appropriate land-management agency will be conducted to determine whether additional Project selected mitigation measures could be implemented to reduce potential effects on these species. Without mitigation, direct effects could include habitat loss and temporary displacement due to noise and activity associated with construction, and indirect effects could include decreased population level, loss of genetic integrity, and habitat fragmentation.

230-Kilovolt Transmission Line

The proposed 230kV transmission line could potentially affect fringed myotis, long-eared myotis, and Townsend's big-eared bat; however, fringed myotis, long-eared myotis, and Townsend's big-eared bat are not known to occur in the transmission line study area. Design Feature 1 (preconstruction surveys for sensitive species) to identify habitat to avoid would minimize potential moderate or high impacts on the bat species. Spatial restrictions for these species are determined on a case-by-case basis (Table 4-139). Without mitigation, direct effects could include habitat loss and displacement, as well as mortality from electrocution or collisions with the transmission line and other Project features, and indirect effects could include habitat fragmentation.

Mainline Valve Distribution Lines

The locations of the approximately 24 distribution lines that would be required to power the MLVs along the pipeline are not known but are assumed and are described in Chapter 2. The transmission line tower spacing and siting would be refined to avoid direct impacts on fringed myotis, long-eared myotis, and Townsend's big-eared bat. Design Feature 1 (preconstruciton surveys for sensitive species) to identify habitat to avoid would minimize potential moderate or high impacts on the bat species. Spatial restrictions for these species are determined on a case-by-case basis (Table 4-139). Residual direct impacts on fringed myotis, long-eared myotis, and Townsend's big-eared bat could be minimized through burial of the

distribution line or use of solar power at the MLV. Without mitigation, direct effects could include habitat loss and displacement, as well as mortality from electrocution or collisions with the distribution lines and other Project features, and indirect effects could include habitat fragmentation.

4.3.23.6 Summary Comparison of Alternative Routes

Big Game

- All alternative routes in all three segments cross critical seasonal ranges for big game species. Residual impacts on big game are anticipated to be low for all alternative routes as a result of application of mitigation measures that would avoid surface-disturbing or disrupting activities during sensitive periods and would limit accessibility in sensitive habitats.

ESA-Listed Species

- Potential yellow-billed cuckoo habitat could be crossed by all alternative routes in Segment 1 at the Green River. However, all alternative routes are located north of USFWS proposed critical habitat, and the riparian habitat present is not thought to be suitable for nesting habitat. Surveys for suitable nesting habitat would be conducted prior to construction for the selected route and if suitable nesting habitat is present, field surveys for yellow-billed cuckoo would be conducted. If yellow-billed cuckoo were found to be present, seasonal restrictions would be determined through the USFWS Section 7 consultation. In addition, the Applicant proposed the use of HDD to avoid disturbance to riparian habitat on both sides of the river. No impacts on yellow-billed cuckoo are anticipated in Segments 2 or 3, as they are located outside of the mapped USFWS yellow-billed cuckoo AOI.
- Segment 1 alternative routes cross areas included in the USFWS mapped AOI for Canada lynx. However, the Canada lynx are primarily found in high-elevation coniferous forest and the Project does not cross any areas known or likely to be occupied by resident Canada lynx. No impacts on Canada lynx are anticipated.

Migratory Birds and Raptors

- All alternative routes in all three segments cross habitat for migratory birds, including BLM sensitive migratory bird species and raptors. Residual impacts on migratory birds, including BLM sensitive migratory bird species and raptors, are anticipated to be low for all alternative routes as a result of application of design features and agency-required mitigation measures, as well as the Bald and Golden Eagle Monitoring Plan.

Greater Sage-Grouse

Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

- All alternatives routes are anticipated to have low residual impacts on greater sage-grouse. All alternative routes cross GHMA and avoid PHMA and SFA. Although Alternative 1C: Figure Four crosses the most greater sage-grouse habitat, higher impacts would be expected from Alternative 1A: Proposed Action and 1A Variation: Dry Basin Draw from crossing an NSO area.
- All alternative routes have a similar number of leks within 4 miles. However, Alternatives 1A: Proposed Action and 1A Variation: Dry Basin Draw cross NSO areas in GHMA, but the Applicant has committed to using HDD or micro-siting to comply with the Wyoming ARMPA.

Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

- Both alternative routes are anticipated to have moderate residual impacts on greater sage-grouse. Both alternative routes cross GHMA, PHMA, and SFA.

- Alternative 2A: Proposed Action would have a greater number of occupied leks within 4 miles, including 2 occupied leks within 0.6 mile in PHMA and 1 occupied lek within 0.25 mile in GHMA. Alternative 2B: Southern Route crosses within 0.6 mile of 1 occupied lek in PHMA and does not cross within 0.25 mile of occupied leks in GHMA.
- Cumulative disturbance using the DDCT would not exceed the 5 percent disturbance cap for either of the alternative routes.

Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

- All alternatives routes are anticipated to have moderate residual impacts on greater sage-grouse. All alternative routes cross GHMA and PHMA.
- Only Alternative 3A: Proposed Action crosses NSO areas in PHMA (i.e., areas within 0.6 mile of leks in PHMA), but the Applicant has committed to using HDD or micro-siting in NSO areas to comply with the Wyoming ARMPA. Alternative 3A: Proposed Action crosses within 4 miles of 7 to 10 more leks than the other two alternative routes.
- Cumulative disturbance using the DDCT would not exceed the 5 percent disturbance cap for any of the alternative routes.

BLM Sensitive Mammal Species

- All alternative routes in all three segments cross WYNDD modeled habitat for BLM sensitive mammals. White-tailed prairie dog is known to occur in Segment 2, and pygmy rabbit is known to occur in proximity to all alternative routes in all three segments. Residual impacts on BLM sensitive mammals are anticipated to be low for all alternative routes. Preconstruction surveys for BLM sensitive mammals would identify occupied habitat that could be affected by the Project, and seasonal or spatial restrictions would be implemented to reduce potential effects.

4.4 Cumulative Effects

4.4.1 Introduction

This section presents the cumulative effects associated with the Project, including (1) a general definition of cumulative effects, (2) elements that were considered in the cumulative effects analysis, (3) the assessment approach, and (4) the results of the assessment of cumulative effects for the Project.

4.4.1.1 Definition

Cumulative impact, as defined by the CEQ (40 CFR 1508.7), is the effect on the environment that results from the incremental impact of the action when added to other past and present actions and RFFAs, regardless of what agency (federal and non-federal) or person undertakes other such action. Cumulative impacts could result from individually minor, but collectively significant actions taking place over a period of time. The purpose of the cumulative effects analysis is to ensure that the decision makers consider the full range of consequences of a Proposed Action and alternative routes, including the No Action Alternative.

The CEQ has defined the resulting effects of a Proposed Action and its alternative routes as direct and indirect. Direct effects are caused by the Project Action and occur at the same time and place. Indirect effects also area caused by the Project Action, but are later in time or further removed in distance, yet are still reasonably foreseeable (40 CFR 1508.8). Cumulative effects, discussed in this chapter, are the total effects on a given resources or ecosystem of all actions taken or proposed.

4.4.1.2 Elements Considered in Cumulative Effects Analysis

The cumulative effects assessment process considered (1) scoping and Project issues; (2) cumulative effect time frames and the resources (or receptors) that could be affected by the Proposed Action and alternative routes; (3) the geographical area in which the impacts would occur; and (4) other past and present actions and RFFAs that have, or could be expected to cause, impacts on these resources when considered with development of the Project.

4.4.1.3 Geographic and Temporal Scope

The geographic scope is the spatial extent where cumulative effects may occur on a resource. The geographic scope is assessed, and will often be different, for each cumulative effects issue. It is generally based on the natural boundaries of the resource affected. In several cases, the geographic scope for a resource is substantially larger for cumulative impacts than the study area for Project-related environmental consequences to considerer an area large enough to encompass likely effects from other projects on the same resource.

The temporal scope is established by the time frame for cumulative effects issue−that is, the duration of short-term and long-term effects anticipated. Together, the geographic and temporal scopes make up the cumulative impact analysis area (CIAA). Table 4-150 describes the CIAA for each resource evaluated.

Table 4-150
Summary Approach to Cumulative Effects Analysis

Resource or Resource Issue	Cumulative Impact Analysis Area		Methods of Analysis
	Geographic Scope	Temporal Scope	
Air Quality	Local airshed defined by county boundaries	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative analysis of potential impacts, including emissions inventories within the CIAA.
GHG Emissions	Local airshed defined by county and state boundaries	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative analysis of potential impacts, including emissions inventories within the CIAA.
Cultural Resources	1-mile-wide study corridor (0.5 mile on either side of the Proposed Action and alternative routes) For NHTs, the indirect effects APE is a radius of 3 miles from any NHT crossing or 3 miles from any NHT Parting of the Ways is a radius of 4 miles from this historic site	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative analysis of potential cumulative effects on cultural resources, including potential for effective mitigation.
Fish and Aquatic Resources	Crucial Streams and perennial streams within 11 subwatersheds in two major watersheds; the Green River and North Fork Platte River described in Table 3 49 for fish and aquatic resources	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Quantitative analysis of potential cumulative effects on Crucial Streams and qualitative analysis on perennial streams and waters within the 11 subwatersheds affected by the Project.
Environmental Justice	Project study area by county (including Sublette, Sweetwater, Fremont, and Natrona counties)	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative analysis of cumulative effects on minority, low-income, and/or tribal communities.
Lands and Realty (Existing, Authorized, Future)	2-mile-wide study corridor (1 mile on either side of the Proposed Action and alternative routes)	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative analysis of potential conflicts with existing, authorized and future land use within the CIAA.
Livestock Grazing	2-mile-wide study corridor (1 mile on either side of the Proposed Action and alternative routes)	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative and quantitative assessment of potential cumulative effects on livestock grazing allotments within the CIAA.
Mineral and Energy Development	2-mile-wide study corridor (1 mile on either side of the Proposed Action and alternative routes)	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative and quantitative analysis of the extent of development associated with the Project and potential cumulative effects on mineral resources with regards to conflicts with development of mineral resources.
Native American Concerns	Same as Cultural Resources	Same as Cultural Resources	Qualitative analysis of potential cumulative effects and the potential for effective mitigation.

Table 4-150
Summary Approach to Cumulative Effects Analysis

Resource or Resource Issue	Cumulative Impact Analysis Area		Methods of Analysis
	Geographic Scope	Temporal Scope	
National Trails System	NSTs: Extent of trail alignment located within a 6-mile-wide study corridor (3 miles on either side of the Proposed Action and alternative routes) NHTs: Extent of high potential sites and route segments for congressionally designated trails, or feasibility study alignments for trails under study, located within a 6-mile-wide study corridor (3 miles on either side of the Proposed Action and alternative routes). Key trail resources outside of this study area will also be considered in the analysis.	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative and quantitative analysis of potential for cumulative effects on the trails' resource qualities, values, associated setting and primary uses
Noise	4-mile-wide study corridor (2 miles on either side of the Proposed Action and alternative routes) for human noise-sensitive receptors 8-mile-wide corridor (4 miles on either side of the Proposed Action and alternative routes) for noise-sensitive wildlife species and greater sage-grouse	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative analysis of potential cumulative effects on existing noise levels near sensitive receptors within the CIAA
Lands with Wilderness Characteristics	2-mile-wide study corridor (1 mile on either side of the Proposed Action and alternative routes)	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative analysis of potential for cumulative effects on the values for which the lands with wilderness characteristic qualities are managed.
Paleontological Resources	2-mile-wide study corridor (1 mile on either side of the Proposed Action and alternative routes)	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative and quantitative analysis of the extent of cumulative surface disturbance in the PFYCs identified in the CIAA
Public Health and Safety	2-mile-wide study corridor (1 mile on either side of the Proposed Action and alternative routes)	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative analysis of the potential cumulative effects on public health and safety from construction and operation within the CIAA from construction of the Project
Recreation	2-mile-wide study corridor (1 mile on either side of the Proposed Action and alternative routes) For SRMAs and ERMAs, complete boundaries of units that intersect the centerline	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative and quantitative analysis of potential conflicts with recreation uses within the CIAA
Social and Economic Conditions	Project study area by county (including Sublette, Sweetwater, Fremont, and Natrona counties)	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative analysis of possible cumulative effects on available workforce, employment, population, housing, public services, and local revenue
Soils and Reclamation	2-mile-wide study corridor (1 mile on either side of the Proposed Action and alternative routes)	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative and quantitative analysis of the potential impacts on areas of high and moderate soil erosion potential
Special Designations (including ACECs, WSAs, and other relevant and important management areas)	Complete boundaries of special designation units that intersect the centerline (Proposed Action and alternative routes)	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative and quantitative analysis of potential impacts on special management areas and the resources for which they are managed

Table 4-150
Summary Approach to Cumulative Effects Analysis

Resource or Resource Issue	Cumulative Impact Analysis Area		Methods of Analysis
	Geographic Scope	Temporal Scope	
Special Status Plants	2-mile-wide study corridor (1 mile on either side of the Proposed Action and alternative routes)	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative and quantitative analysis of the potential for cumulative impacts on special status plant species populations or potential habitats
Transportation and Access	22-mile-wide corridor (11 miles on either side of the Proposed Action and alternative routes)	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative analysis of potential for impacts on the transportation and access within the CIAA
Vegetation (including invasive species and noxious weeds)	2-mile-wide study corridor (1 mile on either side of the Proposed Action and alternative routes)	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative and quantitative analysis of the potential impacts on vegetation communities including the potential spread of noxious weeds
Visual Resources	Scenery: BLM SQRU partially or completed within 3 miles of the Proposed Action and alternative routes Viewers: Defined by the agency-approved KOPs locations that would have views of the Project	5 years for construction and stabilization; for operation and maintenance; assuming proposed utilities would be for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative and quantitative analysis of potential cumulative effects on landform, vegetation, adjacent scenery and views at KOPs
Water Resources (including groundwater and surface water)	2-mile-wide study corridor (1 mile on either side of the Proposed Action and alternative routes)	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative and quantitative analysis of potential cumulative effects on surface and other water resources
Wetlands and Riparian Areas	2-mile-wide study corridor (1 mile on either side of the Proposed Action and alternative routes)	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative and quantitative analysis of potential cumulative effects on riparian and wetland communities within the CIAA
Wild Horses	Complete boundaries of Wild Horse Management Area units that intersect the centerline (Proposed Action and alternative routes)	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative and quantitative analysis of potential cumulative effects on wild horse rangeland and habitat
Wildlife and Fish (including sensitive and special status species)	8-mile-wide corridor (4 miles on either side of the Proposed Action and alternative routes) for all wildlife, except for greater sage-grouse PHMAs. The CIAA for PHMA was consistent with the DDCT process described in Appendix D of the Wyoming ARMPA.	5 years for construction and stabilization; for operation and maintenance; assuming for the life of the Project (50 years or longer) and could be permanent if the Project is not decommissioned	Qualitative and quantitative analysis of potential cumulative effects on wildlife and associated habitat

THIS PAGE INTENTIONALLY LEFT BLANK

4.4.1.4 General Study Approach

The elements considered in the cumulative effects assessment include (1) cumulative effects issues, (2) geographic and temporal scopes defined for analysis, and (3) description of quantitative and/or qualitative analysis are described by resource in Table 4-150. In general, quantitative analyses were performed for issues where the relevant data were available for the CIAA. For purposes of this assessment, quantitative estimates of cumulative effects on resources are based on the estimated spatial extent of development for the Project and each past and present action and other RFFAs. The specific methods used in these estimations are discussed in this section.

The quantitative assessment of cumulative effects was performed using a seven-step process:

1. **Compile Resource Inventory for the CIAA.** The available resource in a CIAA was compiled by overlaying a polygon representing the CIAA identified for a resource issue over the relevant resource inventory data.
2. **Estimate Spatial Extent of Existing Development.** A single base layer of existing development was defined to include the existing land-use inventory developed for the effects analysis; buffered transmission lines, pipelines, railroads, and roads within the study area for direct and indirect effects; LANDFIRE™ data and buffered transmission lines, pipelines, railroads, and roads outside of the study area for direct and indirect effects; and data collected for past and present actions in the Project area boundary.
3. **Estimate Spatial Extent of RFFA Development.** A single base layer of RFFA development was established based on the rationale or assumptions outlined in Table 4-152. For oil and gas development areas, the associated development for each area was estimated based on approved maximum disturbance levels and well pad spacing (i.e., the approved maximum disturbance was distributed equally in the area boundary using approved well pad spacing). The spatial extent of RFFA development was then compiled into a single base. The base layer was not developed to contain individual attribute information; rather, the base layer includes a summary of all attributes.
4. **Estimate Spatial Extent of Project Development**. The area was compiled depending on the CIAA.
5. **Estimate Total Cumulative Development.** The layers were amalgamated to generate an estimated total cumulative development for each CIAA (i.e., the existing development data layer, the RFFA development layer, and the CIAA available resource inventory layer). In areas where existing development, RFFAs, and resource inventory all occurred, only the spatial extent of existing development and the CIAA available resource inventory were calculated (i.e., excluding RFFA development) to eliminate double-counting of development of an RFFA in areas already affected by past actions.
6. **Determine Incremental Project Development.** The spatial extent of the incremental Project effect on an available resource in the CIAA was determined by overlaying the existing and RFFA cumulative development layers with the estimated disturbance calculations generated from the Project description.
7. **Determine Remaining Available Resource.** The spatial extent of the remaining available resource (e.g., sensitive soils, units with high potential for fossil yield [paleontological resources], grazing allotments) in the CIAA was determined by assessing the area outside of the estimated total cumulative development area.

4.4.1.5 Past Present and Reasonably Foreseeable Future Actions

In general, a cumulative action is a past, present, or other Proposed Action or RFFA that potentially has a cumulatively significant impact when combined with the Proposed Action. For purposes of this analysis, RFFAs are proposed projects or actions that have either applied for a permit from local, state, or federal authorities or which are publicly known. Table 4-151 lists the past and present actions in the cumulative effects analysis area. Table 4-152 lists the known RFFAs in the cumulative effects analysis area as shown on MV-16.

4.4.1.5.1 Wyoming Pipeline Authority Corridor Initiative

The WPA Corridor Initiative is a "proposed pipeline right-of-way network designed to connect sources of CO_2 to existing oil fields that are suitable for EOR, via CO_2 flooding" (WPA 2016). Under the WPA Corridor Initiative, the WPA intends to coordinate with the BLM, and other federal agencies, to establish a network of across federally administered lands corridors (currently approximately 1,150.0 miles of pipeline corridor are proposed on federal lands) for future pipeline projects; with a view that WPA could then determine the placement and management of future pipeline projects in these corridors across federally administered lands.

It is intended that potential impacts on resources as a result of the WPA Corridor Initiative will be addressed by the WPA, in coordination with applicable federal, state, and local entities. "An environmental analysis will be completed, per the NEPA, to permit the proposed pipeline corridors on federally managed lands. Additionally, qualified project proponents who intend to build within the WPA Corridor Initiative will be required to complete project specific permits and surveys prior to being given a notice to proceed with construction activities" (WPA 2016).

The WPA Corridor Initiative was not considered as part of the cumulative effects analysis for this project because it is not tied to the Applicant's application and cannot be analyzed as an alternative to the Proposed Action. Further, because the BLM does not currently have any application and is not otherwise actively engaged in a response to WPA's initiative, it does not meet the criteria for either a connected or cumulative action.

Table 4-151
Past and Present Actions

Applicant	Project Name	Type of Action	General Location[1]	Links Crossing the Action	Approximate Size of Action[2]	Ground Disturbance (acres)	Development Assumptions for Analysis[3]	Source of Development Assumptions
Bureau of Land Management Pinedale Field Office								
EnCana Oil and Gas (USA), Inc., BP America Production Company, and other natural gas operators	Jonah Infill Drilling Project	Oil and/or gas development	14 miles southwest of Big Sandy, Sublette County	–	30,550 acres	2,276	450 wells in 30,550 acres = 1 well per 68 acres 5 acres of disturbance per well	ROD for Jonah Field II Natural Gas Development Project EIS (BLM 1998)
Ultra Resources, Inc., Shell Exploration & Production Company, Questar Market Resources including Wexpro Company, BP America Production Company, Stone Energy Corporation, Newfield Exploration Company, Yates Petroleum Corporation, and Anschutz Pinedale Corporation	Pinedale Anticline Project	Oil and/or gas development	Sublette County, west of Pinedale and Boulder	–	197,949 acres	3,899	600 pads in 197,949 acres = 1 pad per 330 acres 13.5 acres of disturbance per pad	ROD for Final Supplemental EIS for Pinedale Anticline Oil and Gas Exploration and Development Project (BLM 2008a)
Cimarex Energy	Rands Butte Gas Development Project	Helium	Sublette and Lincoln Counties, southwest of Big Piney	1-1, 1-2, 1-3, 1-5, 1-6, 1-7	73,713 acres	18,367	Well pad points digitized off Bing aerial imagery 5 acres of disturbance per well (average taken from aerial interpretation) For the Williams Pipeline portion of the Project area, the entire boundary was used as surface disturbance (18,085 acres)	Bing aerial imagery (Bing 2015)
Denbury Onshore, LLC[6]	Riley Ridge Development Project	Oil and/or gas development	Sublette County, west of Big Piney	1-1	17,070 acres	16	Well pad points digitized off map pdf 5.5 acres of disturbance per well (average acreage taken from POD – 16.6 acres of disturbance/3 digitized points = 5.5 acres)	POD Riley Ridge Unit Development Project (SWCA 2014a)
Bureau of Land Management Rawlins Field Office								
Lost Creek ISR, LLC[6]	Lost Creek Uranium ISR Project	Uranium	Sweetwater County, southwest of Bairoil	–	4,195 acres	235	Disturbance boundaries received from BLM Rawlins Field Office	BLM 2015
Kennecott[6]	Kennecott-Sweetwater Uranium Recovery Facility	Uranium	Sweetwater County, southwest of Bairoil	–	15,302 acres	1,562	Disturbance digitized from map pdf	U.S. Nuclear Regulatory Commission 2015
Bureau of Land Management Rock Spring Field Office								
BTA Oil Producers	BTA Oil Producers Bravo Field Development	Oil and/or gas development	25 miles northeast of Superior, Sweetwater County	2-2	4,067 acres	25	Well pad points digitized off Bing aerial imagery 2.5 acres of disturbance per well pad	Bing aerial imagery (Bing 2015); Bravo Field Development EA (BLM 1995)
Grynberg Petroleum Company[6]	Eden Ranch Exploratory Oil and Gas Lease	Oil and/or gas development	14 miles north of Farson, Sweetwater County	2-3	12,622 acres	927	240 wells per township = 1 well every 96 acres 7 acres of disturbance per well	BLM 2013c
HS Resources Inc. and Lario Oil and Gas Company	HS Resources, Inc., Natural Gas Exploration Project	Oil and/or gas development	14 miles east of Eden, Sweetwater County	–	12,654 acres	19	Well pads digitized off Bing aerial imagery	Bing aerial imagery (Bing 2015)

Table 4-151
Past and Present Actions

Applicant	Project Name	Type of Action	General Location[1]	Links Crossing the Action	Approximate Size of Action[2]	Ground Disturbance (acres)	Development Assumptions for Analysis[3]	Source of Development Assumptions
DALEN Resources Oil and Gas Company	Fontenelle Natural Gas Infill Drilling Project	Oil and/or gas development	Lincoln and Sweetwater Counties, east of Fontenelle	2-2	179,185 acres	5,560	1 well per 80 acres 2.5 acres of disturbance per well	Fontenelle Natural Gas Infill Drilling Projects EIS (BLM 1996)
Tom Brown, Inc.	Hay Reservoir Unit Natural Gas Infill Development Project	Oil and/or gas development	26 miles north of Table Rock, Sweetwater County	–	11,658 acres	142	Well pad points digitized off Bing aerial imagery 3 acres of disturbance per well pad	Bing aerial imagery (Bing 2015) EA for Hay Reservoir Unit Natural Gas Infill Development Project (BLM 2004)
Infinity Oil & Gas Company of Wyoming, Inc., Yates Petroleum Corporations, and Merrion Oil & Gas Corporation	Bitter Creek Shallow Oil and Gas Development Project	Oil and/or gas development	2 miles west of Bitter Creek, Sweetwater County	–	18,628 acres	187	61 wells in 18,628 acres = 1 well per 116 acres 60,000 square feet of disturbance per well	EA for Bitter Creek Shallow Oil and Gas Project (BLM 2005)
Burlington Resources Oil and Gas Company LP	Little Monument Natural Gas Project	Oil and/or gas development	9 miles southeast of La Barge, Lincoln and Sweetwater Counties	–	3,844 acres	–	Boundary completely encompassed by the Fontenelle lease boundary, which has more conservative disturbance assumptions—no disturbance created for this project	Not applicable
Yates Petroleum Corporation, Davis Petroleum Corp and Pinnacle Gas Resources, Inc.	Luman Rim Natural Gas Development Project	Oil and/or gas development	25 miles northeast of Point of Rocks, Sweetwater County	2-4	17,029 acres	249	58 wells in 17.029 acres = 1 well per 294 acres 4.4 acres of disturbance per well	EA for Luman Rim Natural Gas Development Project (BLM 2010)
Questar Corporation, Whiting Oil & Gas Corp.	Nitchie Gulch Field	Oil and/or gas development	17 miles southeast of Eden, Sweetwater County	2-2	7,161 acres	58	Well pads digitized off Bing aerial imagery	Bing aerial imagery (Bing 2015)
Berco Resources, LLC, Whiting Oil & Gas Corp.	North Nitchie Gulch	Oil and/or gas development	18 miles southeast of Eden, Sweetwater County	–	2.7 acres	2.7	Entire boundary used as surface disturbance	Not applicable
Texaco USA	Texaco's Stagecoach Draw Unit	Oil and/or gas development	7 miles southwest of Eden, Sweetwater County	2-2	23,544 acres	80	Well pad points digitized off Bing aerial imagery 2.5 acres of disturbance per well pad (average taken from aerial interpretation)	Bing aerial imagery (Bing 2015)
Bridger Coal Company	Ten Mile Rim Coal Lease-by-Application Project	Coal	7 miles northeast of Superior, Sweetwater County	–	5,909 acres	5,909	Entire boundary used as surface disturbance	Not applicable
Additional Actions[4]								
Transmission Line[5]								
–	–	Transmission line	Throughout the Project area	–	–	–	Transmission lines based on averaging corridor widths estimated by 2011 and 2012 National Agriculture Imagery Program (NAIP) aerial imagery interpretation (NAIP 2011b): 345kV transmission lines: 150-foot-wide corridor 230kV transmission lines: 100-foot-wide corridor 115kV transmission lines: 50-foot-wide corridor	POWERmap Platts 2009

Table 4-151
Past and Present Actions

Applicant	Project Name	Type of Action	General Location[1]	Links Crossing the Action	Approximate Size of Action[2]	Ground Disturbance (acres)	Development Assumptions for Analysis[3]	Source of Development Assumptions
Pipelines								
–	–	Pipeline	Throughout the Project area	–	–	–	Pipelines based on averaging corridor widths estimated by 2011 and 2012 NAIP aerial imagery interpretation (NAIP 2011a): 30- to 42-inch-diameter pipelines: 300-foot-wide corridor 20- to 26-inch-diameter pipelines: 200-foot-wide corridor 10- to 18-inch diameter pipelines: 100-foot-wide corridor 6- to 9-inch diameter pipelines: 50-foot-wide corridor	PennWell 2011
Highways/Roads								
–	–	Transportation	Throughout the Project area	–	–	–	Highways and roads are based on averaging corridor widths estimated by 2011 and 2012 NAIP aerial imagery interpretation (NAIP 2011d): Interstate highways: 75-foot-wide corridor Intra-state/Intra-metro Area/Inter-metro Area: 50-foot-wide corridor City/County/Local: 25-foot-wide corridor	Automated Geographic Reference Center 2012
Railroads								
–	–	Transportation	Throughout the Project area	–	–	–	Railroads assume an average corridor width of 25 feet based on 2011 and 2012 NAIP aerial imagery interpretation (NAIP 2011d)	

NOTES:
[1]All locations are approximate unless township/range/section is provided.
[2]The acreage and mileage is calculated from the available data received from agencies or digitized maps. The total acreage is based on the data boundary received from an agency and may not directly reflect what is described in the project description.
[3]The assumptions were used in the quantification portion of the cumulative analysis to achieve an approximate amount of disturbance for each activity.
[4]Additional activities are datasets of existing development but are not called out as individual projects.
[5]The development assumption for transmission lines is based on averaging corridor widths estimated by aerial interpretation for the following voltages:
- 345kV Transmission Lines: 150-foot-corridor
- 230kV Transmission Lines: 100-foot-corridor
- 115kV Transmission Lines: 50-foot-corridor

Rural residential development, farming, grazing, private airstrips, transportation, and mining claims are dispersed throughout the Project area; however, data inventory for these categories was limited to the 2-mile-wide alternative route study corridors.
[6]This project was not included in the quantitative analysis for cumulative effects for the Draft EIS due to date of data received. It will be included for the Final EIS.

Table 4-152
Reasonably Foreseeable Future Actions

Applicant	Project Name	Type of Action	General Location[1]	Links Crossing the Action	Approximate Size of Action[2]	Ground Disturbance (acres)	Development Assumptions for Analysis[3]	Source of Alignments or Boundaries
Bureau of Land Management Kemmerer Field Office								
Anadarko Petroleum Corporation	Blacks Fork EIS (formerly Moxa Arch Area Infill)	Oil and/or gas development	Sweetwater, Uinta, and Lincoln counties	–	474,897 acres	452	1000 pads in 474,897 acres = 1 pad per 475 acres 5 acres of disturbance per pad	NEPA Hotsheet (BLM 2015c); Final Reasonable Foreseeable Development Scenario for Oil and Gas, Kemmerer Field Office (BLM 2006)
Bureau of Land Management Lander Field Office								
Aethon Energy and Burlington Resources Oil and Gas Company LP	Moneta Divide Natural Gas and Oil Development Project EIS (formerly GMI)	Oil and/or gas development (and pipeline)	Fremont and Natrona counties	3-2, 3-4, 3-5	265,758 acres	14,984	4250 pads in 265,758 acres = 1 pad per 62 acres 3.5 acres of disturbance per pad	NEPA Hotsheet (BLM 2015c); Reasonable Foreseeable Development Scenario for Oil and Gas, Lander Field Office (BLM 2009)
Energy Fuels	Sheep Mountain Uranium Project EIS	Solid Mineral	Fremont County, Wyoming	–	3,590 acres	3,590	Entire boundary used as surface disturbance	Not applicable
Bureau of Land Management Pinedale Field Office								
QEP Energy Company[4]	Dry Piney Deep Project	Oil and/or gas development	Sublette County, northwest of Calpet	–	6,025 acres	320 acres	10 well points and a processing plant digitized from map pdf 2 acres of disturbance per pad	Dry Piney Deep Project Fact Sheet and Proposed Action (BLM 2015a)
Bureau of Land Management Rawlins Field Office								
BP and 20 other lease holders	Continental Divide-Creston Natural Gas Project EIS	Oil and/or gas development	25.0 miles west of Rawlins within Carbon and Sweetwater counties	–	1,070,099 acres	13,548	1 pad per 40 acres 3.9 acres of disturbance per pad	Final EIS for Continental Divide-Creston Natural Gas Project (BLM 2016)
Lost Creek ISR, LLC[4]	Lost Creek Uranium Proposed ISR Project	Uranium	Sweetwater County, southwest of Bairoil	–	5,748 acres	2,811 acres	Disturbance boundaries received from BLM Rawlins Field Office	BLM 2015
Bureau of Land Management Rock Spring Field Office								
Koch Exploration and Memorial Resource Development	Bird Canyon Field Infill Project EIS	Oil and/or gas development	Sublette and Lincoln counties	1-6, 1-9	18,515 acres	452	1 pad per 160 acres 3.8 acres of disturbance per pad	Scoping Report (BLM 2014c), Bird Canyon Natural Gas Infill Project EIS (BLM 2014b)
Anadarko Petroleum Corporation	Monell-Arch Oil and Gas Development	Oil and/or gas development		–	22,657 acres Arch portion only: 12,533 acres	82	40 wells in 12,533 acres (Arch portion only) = 1 well per 313 acres 2 acres of disturbance per pad	EA for Montall/Arch Units Oil and Gas Development (BLM 2013a)
Jonah Energy LLC	Normally Pressured Lance Natural Gas Development Project EIS	Oil and/or gas development	68 miles northwest of Rock Springs, Sublette County	2-3	140,859 acres	15,957	1 pad per 160 acres 18 acres of disturbance per pad	NEPA Hotsheet (BLM 2015c); POD for Normally Pressured Lance Natural Gas Development Project, Encana Oil and Gas Inc. (BLM 2011a)

NOTES:
[1]All locations are approximate unless township/range/section is provided.
[2]The acreage and mileage is calculated from the available data received from agencies or digitized maps.
[3]The assumptions were used in the quantification portion of the cumulative analysis to achieve an approximate amount of disturbance for each action.
During the analysis, some known RFFAs in the Project area were identified for which spatial data either have not been received from the field office or forest service or was unavailable due to the Project being in the early stages of development. These RFFAs include:
- Unknown BLM field office
- Rawhide Coal Lease Modification EA

[4]This project was not included in the quantitative analysis for cumulative effects for the Draft EIS due to date of data received. It will be included for the Final EIS.

4.4.2 Air Quality (Including Greenhouse Gas Emissions and Climate Change)

4.4.2.1 Issues Identified

The cumulative effects generally attributed to increased atmospheric GHG levels include melting permafrost; sea level rise; changing global climate patterns; redistribution of plant and animal species; redistribution of disease vectors; and altered precipitation regimes, both spatially and temporally. Current science, however, cannot link any specific instance of GHG emissions or sequestration to any specific climate-related environmental effects.

Other air quality and climate issues related to the Project that have been identified through the scoping process for this study are listed in Section 4.3.1.1. These issues can potentially be aggravated by cumulative impacts from nonconnected projects.

4.4.2.2 Existing Conditions

Tables 3-3 through 3-5 describe the current climate in the Project area. Criteria pollutant and HAP concentrations are presented in several tables within Section 3.2.1.4.

Most of the area crossed by the Proposed Action and alternative routes is in compliance with federal and state ambient air quality standards. The exception is the UGRB marginal ozone nonattainment area, which would be crossed by the entirety of Segment 1 and a portion of Segment 2, regardless of the selected route.

4.4.2.3 Results

The following sections summarize the past and present actions and RFFAs that would affect air quality within each Project segment. The majority of the past and present actions and RFFAs involve oil and gas development. These projects would have similar sources of emissions during construction, including construction exhaust and fugitive emissions from surface-disturbing activities.

4.4.2.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Segment 1 passes through Sublette County. The following past and present actions or RFFAs affect or are expected to affect air quality within Sublette County:

Past and Present Projects

- Jonah Infill Drilling Project
- Pinedale Anticline Project
- Rands Butte Gas Development Project
- Riley Ridge Unit Development
- Existing pipelines, transmission lines, roads, and railroads

Reasonably Foreseeable Future Actions

- Bird Canyon Field Infill Project
- Dry Piney Deep Project
- Normally Pressured Lance Natural Gas Development Project

All the above projects are related to oil and gas development. The construction phase of each project would have similar sources of emissions from heavy equipment exhaust, material handling, and wind

erosion of disturbed areas. The types of effects on air quality would be the same as those identified in Section 4.3.1.2. of this document.

Table 4-153 provides a comparison of the Project-related criteria pollutant, HAP, and GHG emissions for each of the Segment 1 alternative routes with Sweetwater County emission inventories for existing activities.

Table 4-153
Air Pollutant Emissions for Pipeline Construction Compared to Sublette County Emissions in Segment 1

Pollutant (max impact year)	Estimated Project Emissions during Construction (tons per year)[1]	County Emissions (tons per year)[2,3]	Total (tons per year)	Percentage of Contribution of Segment 1 Construction Activities to Countywide Emissions
Alternative 1A: Proposed Action				
PM_{10} (2019)	334	18,027	18,361	1.8%
$PM_{2.5}$ (2019)	52	2,143	2,195	2.4%
NO_x (2018)	33	4,558	4,591	0.7%
SO_2 (2018)	1.7	212	214	0.8%
CO (2019)	15.2	7,527	7,542	0.2%
VOCs (2018)	3.2	11,271	11,274	0.0%
HAPs (2019)	0.40	7,180	7,180	0.0%
CO_2e (2019)	11,553	538,939	550,492	2.1%
Alternative 1A Variation: Dry Basin Draw				
PM_{10} (2019)	334	18,027	18,361	1.8%
$PM_{2.5}$ (2019)	52	2,143	2,195	2.4%
NO_x (2018)	34	4,558	4,592	0.7%
SO_2 (2018)	1.7	212	214	0.8%
CO (2019)	15.2	7,527	7,542	0.2%
VOCs (2018)	3.3	11,271	11,274	0.0%
HAPs (2019)	0.40	7,180	7,180	0.0%
CO_2e (2019)	11,553	538,939	550,492	2.1%
Alternative 1B: Dry Piney				
PM_{10} (2019)	338	18,027	18,365	1.8%
$PM_{2.5}$ (2019)	53	2,143	2,196	2.4%
NO_x (2018)	36	4,558	4,594	0.8%
SO_2 (2018)	1.9	212	214	0.9%
CO (2019)	15.2	7,527	7,542	0.2%
VOCs (2018)	3.5	11,271	11,274	0.0%

Table 4-153
Air Pollutant Emissions for Pipeline Construction Compared to Sublette County Emissions in Segment 1

Pollutant (max impact year)	Estimated Project Emissions during Construction (tons per year)[1]	County Emissions (tons per year)[2,3]	Total (tons per year)	Percentage of Contribution of Segment 1 Construction Activities to Countywide Emissions
HAPs (2019)	0.40	7,180	7,180	0.0%
CO_2e (2019)	11,553	538,939	550,492	2.1%
Alternative 1C: Figure Four				
PM_{10} (2019)	343	18,027	18,370	1.9%
$PM_{2.5}$ (2019)	53	2,143	2,196	2.4%
NO_x (2018)	38	4,558	4,596	0.8%
SO_2 (2018)	2.0	212	214	0.9%
CO (2019)	15.2	7,527	7,542	0.2%
VOCs (2018)	3.7	11,271	11,275	0.0%
HAPs (2019)	0.40	7,180	7,180	0.0%
CO_2e (2019)	11,553	538,939	550,492	2.1%

NOTES:
[1]Estimated emissions include Riley Ridge Sweetening Plant construction.
[2]The Sublette County criteria and HAP inventory data are from the 2011 NEI, a record of emissions information reported to the EPA by states every 3 years (EPA 2015b).
[3]GHG data from Sublette County sources that reported in 2013 for the EPA's Mandatory Greenhouse Gas Reporting Rule, 40 CFR Part 98.

Table 4-154 provides a comparison of the Riley Ridge Sweetening Plant operational emissions compared to Sublette County emissions inventories.

Table 4-154
Air Pollutant Emissions for Riley Ridge Sweetening Plant Operation Compared to Sublette County Emissions in Segment 1

Pollutant	Estimated Project Emissions during Operation (tons per year)	Sublette County Emissions (tons per year)[1,2]	Total (tons per year)	Percentage of Contribution of Riley Ridge Sweetening Plant Operation to Countywide Emissions
PM_{10}	0.0	18,027	18,027	0.0%
$PM_{2.5}$	0.0	2,143	2,143	0.0%
NO_x	21.7	4,558	4,580	0.5%
SO_2	0.0	212	212	0.0%
CO	30.5	7,527	7,558	0.4%
VOCs	2.6	11,271	11,274	0.0%
HAPs	0.2	7,180	7,180	0.0%
CO_2e	49,112	538,939	588,051	8.4%

NOTES:
[1]The Sublette County criteria and HAP inventory data are from the 2011 NEI, a record of historical emissions information reported to the EPA by states every 3 years (EPA 2015b).
[2]GHG data from Sublette County sources that reported in 2013 for the EPA's Mandatory Greenhouse Gas Reporting Rule, 40 CFR Part 98.

Table 4-153 and Table 4-154 indicate minor levels of criteria pollutant, HAP, and GHG emissions associated with construction within the Segment 1 and Riley Ridge Sweetening Plant emissions compared to emissions from existing activities in Sublette County. The operation of the Riley Ridge Sweetening Plant would contribute more than 8 percent of the GHGs in the county when compared to the EPA's 2013 GHG inventory.

The Riley Ridge Sweetening Plant's 49,171 tons/year of CO_2e would be approximately 0.07 percent of the statewide total of 69.4 million metric tons predicted for 2020, per the Wyoming Greenhouse Gas Inventory and Reference Case Projections, 1990-2020 (Center for Climate Strategies [CCS] 2007).

4.4.2.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Segment 2 passes through Sublette, Sweetwater, and Fremont counties. Most of this segment is in Sweetwater County. For purposes of analysis, the past and present actions and RFFAs within Sublette and Fremont counties are included in the Segment 1 and Segment 2 sections of this analysis. The projects in Sweetwater County are summarized below.

- Blacks Fork (Formerly Moxa Arch Area Infill)
- BTA Oil Producers Bravo Field Development
- Continental Divide-Creston Natural Gas Project
- HS Resources, Inc., Natural Gas Exploration Project
- Eden Ranch Exploratory Oil and Gas Lease
- Fontenelle Natural Gas Infill Drilling Project
- Hay Reservoir Unit Natural Gas Infill Development Project
- Bitter Creek Shallow Oil and Gas Development Project
- Little Monument Natural Gas Project
- Lost Creek Uranium ISR Project
- Luman Rim Natural Gas Development Project
- Monell-Arch Oil and Gas Development
- Nitchie Gulch Field
- North Nitchie Gulch
- Normally Pressured Lance Natural Gas Development Project
- Sweetwater Mine Uranium Recovery Facility
- Texaco's Stagecoach Draw Unit
- Ten Mile Rim Coal Lease-by-Application Project
- Gateway West Transmission Line Project

All the projects listed above are related to oil and gas development with four exceptions: the Lost Creek Uranium ISR Project, the Sweetwater Mine Uranium Recovery Facility, the Ten Mile Rim Coal Lease-by-Application Project, and the Gateway West Transmission Line Project. The construction phase of each project would have similar sources of emissions from heavy equipment exhaust, material handling, and wind erosion of disturbed areas. The types of potential effects to air quality are the same as those identified in Section 4.3.1.2. of this document.

Table 4-155 provides a comparison of the Project-related criteria pollutant, HAP, and GHG emissions for each of the Segment 2 alternative routes with Sweetwater County emission inventories for existing activities.

Table 4-155
Air Pollutant Emissions for Pipeline Construction
Compared to Sweetwater County Emissions in Segment 2

Pollutant (max impact year)	Estimated Project Emissions during Construction (tons per year)	Sweetwater County Emissions (tons per year)[1,2]	Total (tons per year)	Percentage of Contribution of Segment 2 Construction Activities to Countywide Emissions
Alternative 2A: Proposed Action				
PM_{10} (2019)	631	19,018	19,649	3.2%
$PM_{2.5}$ (2019	98	5,990	6,088	1.6%
NO_x (2019)	75	38,283	38,358	0.2%
SO_2 (2019)	4	20,460	20,464	0.0%
CO (2019)	27	50,028	50,055	0.1%
VOCs (2019)	8	97,370	97,378	0.0%
HAPs (2019)	1	16,523	16,524	0.0%
CO_2e (2019)	24,753	22,400,000	22,424,753	0.1%
Alternative 2B: Southern Route				
PM_{10}	665	19,018	19,683	3.4%
$PM_{2.5}$	103	5,990	6,093	1.7%
NO_x	79	38,283	38,362	0.2%
SO_2	4	20,460	20,464	0.0%
CO	29	50,028	50,057	0.1%
VOCs	8	97,370	97,378	0.0%
HAPs	1	16,523	16,524	0.0%
CO_2e	26,114	22,400,000	22,426,114	0.1%

NOTES:
[1]The Sweetwater County criteria and HAP inventory data are the 2011 NEI, which is a record of historical emissions information reported to the EPA by states every 3 years (EPA 2015b).
[2]GHG data from Sweetwater County sources that reported in 2013 for the EPA's Mandatory Greenhouse Gas Reporting Rule, 40 CFR Part 98.

The results in Table 4-155 indicate minor levels of criteria pollutant, HAP, and GHG emissions associated with construction proposed within the Segment 2 area when compared to emissions from existing activities in Sweetwater County.

The 24,000 to 26,000 metric tons of CO_2e from the two Segment 2 alternative routes would be approximately 0.04 percent of the statewide total of 69.4 million metric tons predicted for 2020, per the Wyoming Greenhouse Gas Inventory and Reference Case Projections, 1990-2020 (CCS 2007).

4.4.2.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Segment 3 passes through Fremont and Natrona counties. The following past and present actions and RFFAs affect or are expected to affect air quality within Fremont and Natrona counties.

- Moneta Divide Natural Gas and Oil Development Project (formerly GMI)
- Sheep Mountain Uranium Project

The Moneta Divide Project is an oil and gas development project. The Sheep Mountain Project is a uranium mine. The Moneta Divide Project is in Fremont and Natrona counties, while the Sheep Mountain Mine is in Fremont County. The construction phase of each project would have similar sources of emissions from heavy equipment exhaust, material handling, and wind erosion of disturbed areas. The

types of potential effects to air quality are the same as those identified in Section 4.3.1.2. of this document.

Table 4-156 provides a comparison of the Project-related criteria pollutant, HAP, and GHG emissions for each of the Segment 3 alternative routes with Fremont County and Natrona County emission inventories for existing activities.

Table 4-156
Air Pollutant Emissions for Pipeline Construction
Compared to Fremont County and Natrona County Emissions in Segment 3

Pollutant (max impact year)	Estimated Project Emissions during Construction (tons per year)	Fremont County and Natrona County Emissions (tons per year)[1,2,3]	Total (tons per year)	Percentage of Contribution of Segment 3 Construction Activities to Countywide Emissions
Alternative 3A: Proposed Action				
PM10 (2018)	431	57,222	57,653	0.7%
PM2.5 (2018	67	6,724	6,791	1.0%
NOx (2018)	48	9,215	9,263	0.5%
SO2 (2018)	3	2,082	2,085	0.1%
CO (2018)	18	48,854	48,872	0.0%
VOCs (2018)	5	134,212	134,217	0.0%
HAPs (2018)	1	22,195	22,196	0.0%
CO2e (2018)	15,952	898,312	914,264	1.7%
Alternative 3B: Lost Creek to Lost Cabin				
PM10 (2018)	380	57,222	57,602	0.7%
PM2.5 (2018	59	6,724	6,783	0.9%
NOx (2018)	42	9,215	9,257	0.5%
SO2 (2018)	2	2,082	2,084	0.1%
CO (2018)	15	48,854	48,869	0.0%
VOCs (2018)	4	134,212	134,216	0.0%
HAPs (2018)	0	22,195	22,195	0.0%
CO2e (2018)	13,996	898,312	912,308	1.5%
Alternative 3C: Lost Creek to Highway 20/26				
PM10 (2018)	523	57,222	57,745	0.9%
PM2.5 (2018	81	6,724	6,805	1.2%
NOx (2018)	59	9,215	9,274	0.6%
SO2 (2018)	3	2,082	2,085	0.2%
CO (2018)	21	48,854	48,875	0.0%
VOCs (2018)	6	134,212	134,218	0.0%

Table 4-156
Air Pollutant Emissions for Pipeline Construction
Compared to Fremont County and Natrona County Emissions in Segment 3

Pollutant (max impact year)	Estimated Project Emissions during Construction (tons per year)	Fremont County and Natrona County Emissions (tons per year)[1,2,3]	Total (tons per year)	Percentage of Contribution of Segment 3 Construction Activities to Countywide Emissions
HAPs (2018)	1	22,195	22,196	0.0%
CO2e (2018)	19,442	898,312	917,754	2.1%

NOTES:
[1]Values are combined total emissions for Fremont and Natrona counties.
[2]The Fremont County and Natrona County criteria and HAP inventory data are the 2011 NEI, which is a record of historical emissions information reported to the EPA every 3 years by the states (EPA 2015b).
[3]GHG data from Fremont County and Natrona County sources that reported in 2013 for the EPA's Mandatory Greenhouse Gas Reporting Rule, 40 CFR Part 98.

The results in Table 4-156 indicate minor levels of criteria pollutant, HAP, and GHG emissions associated with construction in the Segment 3 area when compared to emissions from existing activities in Fremont and Natrona counties.

The 22,000 to 31,000 metric tons of CO_2e from the three Segment 3 alternative routes would be approximately 0.04 percent of the statewide total of 69.4 million metric tons predicted for 2020, per the Wyoming Greenhouse Gas Inventory and Reference Case Projections, 1990-2020 (CCS 2007).

4.4.2.3.4 Air Quality Results

Except for the UGRB marginal ozone nonattainment area, no existing activities or projects currently result in significantly adverse impacts on air quality within the Project area. This observation is supported by the ambient pollutant concentration data collected in the Project area and summarized in Section 3.2.1. Furthermore, no RFFAs in the Project area are expected to produce air pollutant emissions that would be of such quantity and that would be near enough in time and space to the Project's peak emissions to result in a cumulatively significant impact on air quality.

Cumulative impacts on ambient ozone concentrations in the UGRB marginal ozone nonattainment area are a concern. However, potential ozone precursor emissions due to construction activities have been shown to be below *de minimis* values for federal conformity demonstration purposes. Ozone precursor emissions that would result from operation of the Riley Ridge Sweetening Plant will be required to be offset; consequently, constructing and operating the Riley Ridge Sweetening Plant will result in an impact of reducing air quality impacts related to ozone concentrations. Riley Ridge Sweetening Plant emissions of other air pollutants would be small, and the air quality permitting process would ensure that impacts from those emissions would be insignificant.

4.4.2.3.5 Greenhouse Gas Emissions

Pipeline construction would create approximately 300 tons of CO_2e emissions per mile of pipeline. Construction of the Riley Ridge Sweetening Plant would result in approximately 31,000 tons of CO_2e over 2 years. Total emissions for the Applicant's Preferred Alternative pipeline route and Riley Ridge Sweetening Plant construction would total approximately 0.10 million tons of CO_2e during the construction phase over the course of 2 years. Therefore, annual emissions would be 0.05 million tons. For perspective, Table 4-157 compares these emission rates with emission rates reported for other select sources.

Table 4-157
Greenhouse Gas Emissions from the Project and Other Sources

GHG Emission Rate (million tons CO_2e/year)	Source
0.05	Riley Ridge Sweetening Plant operation
0.05	Project construction activities
0.79	Neil Simpson II coal-fired power plant[1]
15.0	Jim Bridger coal-fired power plant[2]
69.4	Wyoming 2020 projected statewide emission rate[3]
5,949	United States energy-related CO_2 emissions in 2013[4]

NOTES:
[1]2012 GHG emissions from Wyoming's smallest coal power plant, per the Final Clean Power Plan (EPA 2015a)
[2]2012 GHG emissions from Wyoming's largest coal power plant, per the Final Clean Power Plan (EPA 2015a)
[3]Wyoming Greenhouse Gas Inventory and Reference Case Projections, 1990-2020 (CCS 2007)
[4]U.S. energy-related CO_2 emissions in 2013 (Energy Information Administration 2014)

The Project would inject up to 600 MMcf/d (approximately 35,000 tons per day) of previously stored CO_2 into subsurface geologic formations. All, or nearly all, of the CO_2 is expected to ultimately remain underground, but no site-specific or site-related studies have supported this assumption. Further, no data or analyses have been presented on which to base an estimate of long-term carbon sequestration effectiveness for the Project. Without appropriate scientific analysis or empirical data, it is not possible to estimate with a reasonable degree of certainty potential CO_2 emissions from EOR using the Project's CO_2.

Based solely on a comparison of reasonably quantifiable Project GHG emissions with statewide and national emissions as described above, neither the construction nor the operation of the Project would add significantly to existing cumulative effects on climate within the study area, the region, or globally. However, because the Project would liberate large quantities of previously stored CO_2 and reinject them into subsurface geologic formations, and because no site-specific or site-relevant data or analyses exist to project permanent sequestration efficiency, it is impossible to conclude that the Project will not significantly affect climate.

4.4.3 Cultural Resources

4.4.3.1 Issues Identified

Over time, cultural resources are subject to attrition as cultures change and sites weather and erode. In addition, prior development in the region has either degraded or resulted in the loss or discovery of some cultural resources. The addition of the Project to past and present actions and RFFAs would result in a greater potential for effects on cultural resources throughout the Project study area.

Cumulative effects on cultural resources would occur over the life of the Project and other current and future projects, including direct effects during construction and direct and indirect effects during operation and maintenance activities. Disturbances from future developments and ground-disturbing activities could uncover or destroy unrecorded cultural resources. Future actions proposed on federal and/or state lands would require cultural resource evaluations and mitigation of affected historic properties prior to implementation. The resulting cultural resource documentation would increase the cultural resources knowledge base for the overall region; however, developments solely on private land are largely exempt from this requirement.

4.4.3.2 Existing Conditions

The affected environment describes the baseline conditions for cultural resources (refer to Section 3.2.2).

4.4.3.3 Results

Past and present actions and RFFAs within the Project study area for cultural resources include:

Past and Present Projects

- Rands Butte Gas Development Project
- Jonah Infill Drilling Project

Reasonably Foreseeable Future Actions

- Bird Canyon Field Infill Project
- Normally Pressured Lance Natural Gas Development Project
- Continental Divide-Creston Natural Gas Project
- Moneta Divide Natural Gas and Oil Development Project EIS (formerly GMI)

4.4.3.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Some contribution to cumulative effects on cultural resources from direct adverse effects associated with the construction and operation phase of the Project would be likely in this portion of the study area. The types of effects on cultural resources would be the same as those described in Section 4.3.2.2. Cultural resources could be destroyed by construction activities and ancillary facilities development. Development of new access corridors and rights-of-way could increase access to previously inaccessible areas, leading to potential vandalism of cultural resources. There also could be cumulative effects from indirect effects in the form of introduced visual, atmospheric, and audible elements that could detract from the cultural importance of potential TCPs or other significant cultural resources. These indirect effects also could adversely affect historic properties or sites that have the potential to be listed in the NRHP. The introduction of additional development could alter the setting and feeling of historic properties.

As a result of the presence of existing development projects and proposed future actions, cultural resources that may be encountered could be adversely affected throughout the Project study area.

Overall, the addition of the Project to past and present actions and RFFAs would result in a greater potential for cumulative effects on historic properties and other potentially significant cultural resources, including:

- Prehistoric and historic habitations, prehistoric campsites, prehistoric and historic rock art, and the Opal Wagon Road
- The Lander Cutoff of the California NHT (refer to Section 4.4.8)
- Native American concerns (including Chimney Butte landscape) and potential TCPs (refer to Section 4.4.9)

The extent of cumulative effects on cultural resources could be reduced significantly through avoidance and implementation of other mitigation measures or treatments identified through the consultation process. Potential effects on cultural resources in the area would be incremental; however, it may be possible to avoid, minimize, or mitigate such effects. There will be indirect cumulative effects on cultural resources as a result of increased public access. The extent of these impacts is unknown.

4.4.3.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

The addition of the Project to past and present actions and RFFAs would result in a greater potential for cumulative effects on historic properties and other potentially significant cultural resources, including:

- Prehistoric habitations and campsites, the NRHP-listed Arapahoe and Lost Creek Site (48SW4882), the Bryan to South Pass Stage Road, the New Fork to Rock Springs Road, the New Fork Wagon Road, the Green River to South Pass Road, the Rock Springs to Lander Road, and the Point of Rocks to South Pass Road
- The NRHP-listed Parting of the Ways (48SW4198)
- The Emigrant NHTs, the North Sublette Meadow Springs variant of the Sublette Cutoff, the Sublette Cutoff of the California NHT, the Little Sandy Crossing of the Sublette Cutoff, and NHT-associated sites (refer to Section 4.4.8)
- West Sand Dunes Archaeological District and Greater Sand Dunes ACEC
- Teakettle Dune Field
- Native American concerns (including the Boars Tusk) and potential TCPs (refer to Section 4.4.9)

For the Greater Sand Dunes ACEC and the Teakettle Dune Field, there is a high potential for encountering numerous unrecorded, cultural resources.

The types of effects on cultural resources would be the same as those described in Section 4.3.2.2.

4.4.3.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

The addition of the Project to past and present actions and RFFAs would result in a greater potential for cumulative effects on historic properties and other potentially significant cultural resources, including:

- Prehistoric and historic habitations, prehistoric and historic campsites, two NRHP-listed properties (Powder River Train Station and Waltman Crossing), the Crooks Gap Stage Station, the Home on the Range Stage Station, the Rawlins to Fort Washakie Road, the Casper to Lander Road, and the Yellowstone Highway
- The Emigrant NHTs, the Bridger Trail, and NHT-related sites (refer to Section 4.4.8)
- Native American concerns (including Cedar Ridge TCP and associated sites) and potential TCPs (refer to Section 4.4.9)

The pipeline and Moneta Divide Natural Gas and Oil developments will have cumulative effects on the Cedar Ridge TCP. The Project will have cumulative effects on cultural resources that the tribes have said are related to the Cedar Ridge (especially for Alternative 3A: Proposed Action, although cumulative effects would also pertain to sites on Alternative 3B: Lost Creek to Lost Cabin, even though the Project would be in an existing utility corridor). This is very important when considering the cumulative effects on the larger landscape that is important to the tribes.

The types of effects on cultural resources would be the same as those discussed in Section 4.3.2.2.

4.4.4 Fish and Aquatic Resources

4.4.4.1 Issues Identified

Issues related to fish and aquatic resources include potential cumulative impacts on crucial streams and waterbodies with native fish and aquatic species and potential impacts on habitat.

4.4.4.2 Existing Condition

The affected environment describes the baseline conditions for fish and aquatic resources (refer to Section 3.2.3).

4.4.4.3 Results

The fish and aquatic resources analysis for cumulative effects is based on identifying past and present actions and/or RFFAs located both upstream and downstream of and within 11 subwatersheds in 2 major watersheds crossed by the Project (Green River and North Fork Platte River). The types of effects on fish and aquatic resources would be the same as discussed in Section 4.3.3.2. Regardless of location within the watershed, the identified actions potentially could cumulatively affect downstream receiving waters by contributing impacts with other downstream actions. The geographic scope for all fish and aquatic resources analyzed includes the following past and present actions or RFFAs within the Wyoming sections of the Green River and Platte River watersheds and the Great Divide Basin where the Project is located:

- Past and present projects
- Pinedale Anticline Pipeline
- Highway/roads within the CIAA

Information on these cumulative projects is presented in Table 4-151 and Table 4-152. The cumulative effects summary for fish and aquatic resources is presented in Table 4-158.

Table 4-158
Cumulative Effects Summary for Fish and Aquatic Resources

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	1,524	0	410	1,113	<1
1A Variation: Dry Basin Draw	1,341	0	351	991	<1
1B: Dry Piney	1,341	0	351	991	<1
1C: Figure Four	2,136	0	363	1,773	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	504	0	15	489	<1
2B: Southern Route	9	0	0	9	0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	0	0	0	0	0
3B: Lost Creek to Lost Cabin	0	0	0	0	0
3C: Lost Creek to Highway 20/26	0	0	0	0	0

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

The percentage of the incremental Project contribution to cumulative effects on fish and aquatic resources, including crucial streams, would be less than 1 percent, regardless of the alternative route selected. Various past and present actions and RFFAs would occur in the CIAA. Cumulative development would affect the most acres in Segment 1 of the CIAA, but it varies little by alternative route. Segment 1

has the most fish and aquatic resources, including fish habitat occurring in perennial streams that are not designated crucial streams. Segment 2 is mostly in the Great Divide Basin and the potential effects are located where the western portion of Segment 2 extends into the Green River watershed or crosses the Big Sandy River. In Segment 3, no crucial streams or aquatic conservation areas exist within the Project study area and cumulative impacts on these resources were not identified in the quantitative cumulative effects analysis above (Table 4-158). The incremental Project development of crucial streams or aquatic conservation areas is expected to be minimal in all segments, primarily due to the colocation of Project alternative routes with existing or reasonably foreseeable development in these areas. This colocation is expected to reduce Project-related cumulative impacts to less than 1 percent for all alternative routes considered.

When considering anticipated impacts from the Project and other actions defined in the geographic scope, there are several potential cumulative effects to consider. In linear waterbodies, including crucial streams, cumulative effects tend to increase downstream or in the lower reaches of the watershed below the impacts. Cumulative effects could include habitat loss and mortality, oxygen depletion, and water quality changes resulting from increased sedimentation. Habitat loss could also occur where impediments to fish passage are associated with the actions resulting in disruptions to fish migration. Habitat loss and mortality could result in impacts on fish and aquatic species populations and distribution, consequently resulting in effects on prey or forage and habitat for nonaquatic species. The latter includes negative effects on other animals dependent on fish and aquatic species, such as the osprey, a raptor that exclusively preys on fish.

On federally administered lands, the short-term cumulative effects of surface-disturbing activities associated with construction of the Project would be avoided or minimized through micro-siting, alternative construction techniques, and environmental monitoring during construction. However, the long-term cumulative effects could include reduced habitat and prey or forage availability where permanent disturbance would result from cumulative Project development near fish and aquatic resources. Permanent disturbance from the Project would be minimized through post construction reclamation.

4.4.5 Geology and Topography

4.4.5.1 Issues Identified

Potential cumulative effects on geologic hazards include increased landslide susceptibility resulting from the loss of vegetation or ground-disturbing activities related to the construction phase of the Project and other cumulative projects in the CIAA. Also, ground-disturbing activities from cumulative effects, in areas with potential flood hazard, could change or modify the existing drainage patterns of an area and potentially result in expansion of, or alteration of, an existing flood zone. Potential cumulative effects on mineral resources include potential for conflicts with development of mineral resources within the CIAA.

4.4.5.2 Existing Conditions

Areas of the Project with moderate and high susceptibility to flooding occur for all alternative routes. Areas with high susceptibility to landslides occur in the CIAA.

No active mines or active mining claims were identified within the CIAA but producing oil and gas wells, existing lease areas for oil and gas development, and potential mineral resources are present in the CIAA.

4.4.5.3 Results

In addition to the Project, past and present actions and other RFFAs in the CIAA for geology and topography include:

Past and Present Projects

- Rands Butte Gas Development Project
- Luman Rim Natural Gas Development Project
- BTA Oil Producers Bravo Field Development
- Eden Ranch Exploratory Oil and Gas Lease
- Fontenelle Natural Gas Infill Drilling Project
- Luman Rim Natural Gas Development Project
- Nitchie Gulch Field
- Riley Ridge Unit Development
- Texaco's Stagecoach Draw Unit
- Existing pipelines, transmission lines, roads, and railroads

Reasonably Foreseeable Future Actions

- Bird Canyon Field Infill Project
- Normally Pressured Lance Natural Gas Development
- Sheep Mountain Uranium Project
- Moneta Divide Natural Gas and Oil Development

4.4.5.3.1 Landslide Susceptibility and Flood Zones

The types of effects on geology and topography would be the same as those described in Section 4.3.4.2. The incremental effects of the Project on landslide susceptibility and flood zones is associated with the amount of ground-disturbing activities in areas that have moderate to high susceptibility to these hazards. The amount of areas crossed by the Project having high susceptibility to landslides and flood zones is small. The implementation of the Project in areas already identified as having high landslide susceptibility could trigger landslides. Continual ground-disturbing activities in areas with RFFAs could increase the potential of a landslide in those areas previously disturbed. In flood zones, the greatest impact from incremental effects by the Project and RFFAs would be to changes in existing water flow and drainage patterns that might change the amount of susceptibility to a flood.

4.4.5.3.2 Mineral Resources

The types of effects on minerals resources would be the same as those described in Section 4.3.4.2. The cumulative effects for mineral resources are presented in Table 4-159 through Table 4-162. The percentage of incremental Project contribution to cumulative effects on mineral resource development, existing leases, and oil and gas and geothermal wells would be less than 1 percent for the Proposed Action, regardless of the alternative route selected. Cumulative development would affect the most acres in Segment 1 of the CIAA but the incremental impact varies little by alternative route.

Table 4-159
Cumulative Effects Summary for Active Mines and Mining Claims

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	0	0	0	0	0.0
1A Variation: Dry Basin Draw	0	0	0	0	0.0
1B: Dry Piney	0	0	0	0	0.0
1C: Figure Four	0	0	0	0	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	0	0	0	0	0.0
2B: Southern Route	0	0	0	0	0.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	62	0	17	44	0.0
3B: Lost Creek to Lost Cabin	57	0	17	39	0.0
3C: Lost Creek to Highway 20/26	57	0	17	39	0.0

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-160
Cumulative Effects Summary for All Existing Lease Areas

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	31,682	16	1,331	30,351	<1
1A Variation: Dry Basin Draw	32,166	17	1,344	30,822	<1
1B: Dry Piney	37,284	15	4,070	33,214	<1
1C: Figure Four	45,042	14	12,462	32,580	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	78,326	37	4,866	73,460	<1
2B: Southern Route	95,941	46	3,046	92,895	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	52,049	17	3,281	48,768	<1
3B: Lost Creek to Lost Cabin	72,719	20	5,410	67,308	<1
3C: Lost Creek to Highway 20/26	82,835	14	6,179	76,655	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-161
Cumulative Effects Summary for Producing Oil and Gas and Geothermal Wells

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	1,052	1	81	971	<1
1A Variation: Dry Basin Draw	950	1	71	879	<1
1B: Dry Piney	1,022	0	375	647	<1
1C: Figure Four	2,112	1	1,396	716	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	136	0	6	129	<1
2B: Southern Route	222	0	19	203	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	327	0	22	305	<1
3B: Lost Creek to Lost Cabin	617	0	66	551	<1
3C: Lost Creek to Highway 20/26	725	0	68	657	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-162
Cumulative Effects Summary for Potential Mineral Development

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	11,645	5	525	11,120	<1
1A Variation: Dry Basin Draw	11,596	4	499	11,096	<1
1B: Dry Piney	16,868	5	3,013	13,854	<1
1C: Figure Four	30,147	6	12,162	17,986	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	31,038	11	1,634	29,405	<1
2B: Southern Route	73,493	36	2,511	70,982	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	39,974	13	2,873	37,101	<1
3B: Lost Creek to Lost Cabin	36,163	9	3,196	32,967	<1
3C: Lost Creek to Highway 20/26	37,337	8	3,022	34,315	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

4.4.6 Lands and Realty

No distinct analysis for cumulative effects was conducted for existing land use, authorized projects, or future land use because all or some of the projects are considered as past and present actions or RFFAs, and all resource types use these project types as part of the cumulative effects analysis. For a list of the past and present actions and RFFAs, refer to Table 4-151 and Table 4-152.

4.4.7 Livestock Grazing

4.4.7.1 Issues Identified

Potential impacts on grazing allotments include crossing of grazing allotments and potential incompatible uses. These impacts would be intensified where other existing actions have already affected the grazing allotment or an RFFA is proposed in the same area.

4.4.7.2 Existing Conditions

The affected environment describes the baseline conditions for livestock grazing (Section 3.2.6).

4.4.7.3 Results

Past and present actions and RFFAs within the geographic scope include:

Past and Present Projects

- Rands Butte Gas Development Project
- Luman Rim Natural Gas Development Project
- BTA Oil Producers Bravo Field Development
- Eden Ranch Exploratory Oil and Gas Lease
- Fontenelle Natural Gas Infill Drilling Project
- Lost Creek Uranium ISR Project
- Nitchie Gulch Field
- Riley Ridge Unit Development
- Texaco's Stagecoach Draw Unit
- Existing pipelines, transmission lines, roads, and railroads

Reasonably Foreseeable Future Actions

- Bird Canyon Field Infill Project
- Dry Piney Deep Project
- Lost Creek Uranium Proposed ISR Project
- Normally Pressured Lance Natural Gas Development Project
- Sheep Mountain Uranium Project
- Sweetwater Uranium Recovery Facility
- Moneta Divide Natural Gas and Oil Development Project (formerly GMI)

The cumulative effects summary for grazing allotments is presented in Table 4-163.

Table 4-163
Cumulative Effects Summary for Grazing Allotments on Bureau of Land Management Administered Lands

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	260,069	17	23,419	236,650	<1
1A Variation: Dry Basin Draw	260,069	17	23,419	236,650	<1
1B: Dry Piney	261,968	16	24,076	237,892	<1
1C: Figure Four	260,069	13	23,415	236,654	<1

Table 4-163
Cumulative Effects Summary for Grazing Allotments on Bureau of Land Management Administered Lands

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	1,433,934	94	33,876	1,400,058	<1
2B: Southern Route	2,214,093	91	56,912	2,157,181	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	910,089	36	18,700	891,389	<1
3B: Lost Creek to Lost Cabin	811,347	23	25,399	785,948	<1
3C: Lost Creek to Highway 20/26	767,417	17	21,114	746,303	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

The grazing allotments crossed by the Project are primarily located on BLM-administered lands. Various past and present actions and RFFAs would occur throughout the grazing allotments in the CIAA. The short-term cumulative impacts of the Project, in addition to the past and present actions and RFFAs, would include construction activities of projects that would require gates being added to existing fences; construction-related disturbances (noise, vehicles/equipment, and personnel) associated with development of access roads, site grading, and building structures; and larger footprints of disturbance before restoration activities occur. The long-term cumulative impacts would be reduced grazing/rangeland available where permanent disturbance and structures footprints would occur from the projects.

Based on the quantitative analysis approach for this EIS, the percentage of the incremental Project contribution to cumulative effects on grazing allotments would be less than 1 percent, regardless of the alternative route selected. However, the BLM recognizes, based on input received from the Wyoming Department of Agriculture, that there are currently many past and present actions that have failed reclamation or site rehabilitation. These past projects have not been fully reclaimed as originally intended and in many cases, are infested with weeds (e.g., halogeten and thistle) due to low precipitation, poor seed germination, poor seed to soil contact, or other various reasons.

To facilitate a comparison for alternative routes in this EIS, this quantitative analysis presents disturbance calculations based on the POD or digitized surface disturbance for past and present actions. While it is not feasible to account for the actual disturbance generated by past failed reclamations, the BLM acknowledges that the quantitative analysis for disturbance presented here for grazing allotments may be greater than 1 percent because the past and present actions have more actual disturbance than what was assumed for the analysis. However, the Applicant cannot be held responsible for other past and present actions not meeting reclamation standards.

4.4.8 National Trails System

4.4.8.1 Issues Identified

Cumulative effects on a NST or NHT (including trails under feasibility study) could result from the development of past and present actions and RFFAs through the modification of the trail's resources, qualities, values, and associated settings, or primary use(s). Due to the colocation of the four NHTs, cumulative effects on the National Trails System are described in three classifications: (1) NHTs (Oregon, Mormon Pioneer, California, and Pony Express), (2) Sublette Cutoff Historic Trail, and (3) CDNST.

4.4.8.2 Existing Conditions

4.4.8.2.1 National Historic Trails

In Segment 1, only the California NHT is in proximity to the Project. As described in the direct and indirect impact discussions, the character of this area has been affected by landscape modifications, including oil and gas operations, the Riley Ridge Treatment Plant, and other industrial development.

In Segment 2, all four NHTs share the same alignment up to Parting of the Ways, where the Sublette Cutoff portion of the California NHT continues westward while all the other routes turn to the southwest. In the CIAA, the character of the area is generally intact with limited cultural modifications except for highways, county roads, two-tracks, and communication facilities.

In Segment 3, all four NHTs also share the same alignment in an area with existing pipelines, 230kV transmission lines, and development adjacent to Jeffrey City.

4.4.8.2.2 Sublette Cutoff of the California NHT

The setting for the Sublette Cutoff, only adjacent to Segment 2, is generally intact with limited cultural modifications except for highways, county roads, two-tracks, and communication facilities.

4.4.8.2.3 Continental Divide National Scenic Trail

The setting in the areas adjacent to the CDNST, in Segments 2 and 3, have been modified by existing pipelines, a 230kV transmission line, and mining operations.

4.4.8.3 Results

The types of effects to the National Trails System would be the same as those described in Section 4.3.7.2. The quantification of cumulative effects on (1) NHTs, (2) the Sublette Cutoff Historic Trail, and (3) CDNST are described in Table 4-164 through Table 4-166. The total available resource, by trail, is the acreage with the trail-specific study corridor described in Section 3.2.7.3 (i.e., area within 3 miles of the trail and 3 miles of the Project). To assess the incremental Project effects and estimated cumulative development, in a manner similar to other resources (refer to Section 0 for further information), cumulative effect analyses are based on the acres occupied by the Project's footprint and of other cumulative effect projects (past, present, and RFFAs) respectively. The remaining resource column refers to the acres within the trail-specific study corridor not modified by cumulative development or the Project. The final column, percentage of Project impacts, is the calculation of the incremental Project development compared to the total available resource (trail-specific study corridor). Note that these calculations are associated with direct impacts on the lands within the trail-specific study corridor and do not include the indirect effect on trail setting. Narrative descriptions of the cumulative effects, by Project segment, are described in the subsequent sections, including indirect effects on trail setting.

Table 4-164
Cumulative Effects Summary for National Historic Trails (Oregon, Mormon Pioneer, California, and Pony Express)

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	30,739	5	5,666	25,074	<1
1A Variation: Dry Basin Draw	30,739	5	5,666	25,074	<1
1B: Dry Piney	30,739	5	5,665	25,074	<1
1C: Figure Four	30,739	4	5,665	25,074	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	39,030	10	792	38,238	<1
2B: Southern Route	25,065	6	345	24,720	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	35,081	5	1,170	33,910	<1
3B: Lost Creek to Lost Cabin	35,081	5	1,171	33,910	<1
3C: Lost Creek to Highway 20/26	35,081	5	1,170	33,910	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-165
Cumulative Effects Summary for the Sublette Cutoff Historic Trail

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	0	0	0	0	0.0
1A Variation: Dry Basin Draw	0	0	0	0	0.0
1B: Dry Piney	0	0	0	0	0.0
1C: Figure Four	0	0	0	0	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	32,002	7	668	31,335	<1
2B: Southern Route	24,967	6	217	24,750	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	0	0	0	0	0.0
3B: Lost Creek to Lost Cabin	0	0	0	0	0.0
3C: Lost Creek to Highway 20/26	0	0	0	0	0.0

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-166
Cumulative Effects Summary for the Continental Divide National Scenic Trail

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	0	0	0	0	0.0
1A Variation: Dry Basin Draw	0	0	0	0	0.0
1B: Dry Piney	0	0	0	0	0.0
1C: Figure Four	0	0	0	0	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	33,843	2	2,137	31,707	<1
2B: Southern Route	33,843	2	2,137	31,707	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	33,843	2	2,137	31,707	<1
3B: Lost Creek to Lost Cabin	33,843	2	2,137	31,707	<1
3C: Lost Creek to Highway 20/26	33,843	2	2,137	31,707	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

4.4.8.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

4.4.8.3.1.1 National Historic Trails

As described previously, the setting for the California NHT in Segment 1 of the Project has been influenced by industrial development and appears modified in character. The introduction of the Project would have minor effects on the California NHT, approximately five additional acres of disturbance, and due to the high level of visual screening afforded by Riley Ridge, influence of the Project on the trail's setting will be limited. No RFFAs are anticipated to occur in this area. Of the 30,739 acres within the trail-specific study corridor, approximately 18.4 percent would be directly modified by past, present, and reasonably foreseeable actions with the Project affecting less than 1 percent of this area. Beyond the 6-mile-wide study corridor associated with Project additive cumulative effects, additional impacts would occur where past, present, and RFFA (refer to Tables 4-148 and 4-149 and MV-18) would be located adjacent to the California NHT influencing the trail's setting. In addition, the Sublette Cutoff Historic Trail of the California NHT is not in proximity to Segment 1 of the Project; therefore, no cumulative effects are anticipated in this area.

4.4.8.3.1.2 Continental Divide NST

The CDNST is not in proximity to Segment 1 of the Project; therefore, no cumulative effects are anticipated in this area.

4.4.8.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

4.4.8.3.2.1 National Historic Trails

The four NHTs share the same alignment in this segment of the Project and cross areas with limited cultural modifications except for existing road networks and communication facilities. The introduction of the Project, approximately 10 acres of disturbance for Alternative 2A: Proposed Action and 6 acres of

disturbance for Alternative 2B: Southern Route, would generate a geometrically cleared right-of-way through primarily sagebrush vegetation. Due to the limited extent of existing modifications in the area, the Project would indirectly influence a larger area than the footprint as described in Section 4.4.8.3. The application of agency-required mitigation measures, including boring under the trail, would minimize these effects. Additionally, through site reclamation these effects would lessen over time in areas where views of the Project's geometrically cleared right-of-way, beyond the areas bored, would occur. No RFFAs are anticipated to occur in this area. Of the 39,030 acres within the trail-specific study corridor in Alternative 2A: Proposed Action, approximately 2 percent would be directly modified by past, present, and RFFAs with the Project affecting less than 1 percent of this area. The Southern Route alternative would affect approximately 1.4 percent of the 25,065 acres within the trail-specific study corridor with the Project affecting less than 1 percent of this area. Beyond the 6-mile-wide study corridor associated with Project additive cumulative effects, additional impacts would occur where past, present, and RFFA (refer to Tables 4-148 and 4-149 and MV-18) would be located adjacent to the four NHTs influencing the trail's setting.

4.4.8.3.2.2 Sublette Cutoff Historic Trail

Similar to the NHTs, the setting adjacent to the Sublette Cutoff is generally intact with modifications visible associated with existing road networks and communication facilities. The Project would introduce a geometrically cleared right-of-way, which through agency-required mitigation measures, including boring under the trail and site reclamation, would diminish its long-term effects and its indirect influence on adjacent lands where the Project would be incongruent with the existing setting. No RFFAs are anticipated to occur in this area. Of the 32,002 acres within the trail-specific study corridor in Alternative 2A: Proposed Action, approximately 2.1 percent would be directly modified by past, present, and RFFAs with the Project affecting less than 1 percent of this area. Alternative 2B: Southern Route would affect approximately 1 percent of the 25,065 acres within the trail-specific study corridor with the Project affecting less than 1 percent of this area. Beyond the 6-mile-wide study corridor associated with Project additive cumulative effects, additional impacts would occur where past, present, and RFFA (refer to Tables 4-148 and 4-149 and MV-18) would be located adjacent to the Sublette Cutoff influencing the trail's setting.

4.4.8.3.2.3 Continental Divide National Scenic Trail

The area adjacent to the CDNST in this segment of the Project has been modified by existing pipelines, a 230kV transmission line, and mining operations. The introduction of the Project, approximately 2 acres of disturbance, and the Sheep Mountain Uranium Project would lead to additional industrial development within view of the CDNST. Through successful reclamation of the Project, the Project's influence on cumulative effects would diminish over the long term. Of the 33,843 acres within the trail-specific study corridor, approximately 6.3 percent would be directly modified by past, present, and RFFAs with the Project affecting less than 1 percent of this area. Beyond the 6-mile-wide study corridor associated with Project additive cumulative effects, additional impacts would occur where past, present, and RFFA (refer to Tables 4-148 and 4-149 and MV-18) would be located adjacent to the CDNST influencing the trail's setting.

4.4.8.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

4.4.8.3.3.1 National Historic Trails

The four NHTs also share the same alignment in this segment of the Project but cross an area modified by existing pipelines, a 230kV transmission line, and development adjacent to Jeffrey City. The introduction of the Project, approximately 5 acres of disturbance, would negligibly incrementally increase cumulative effects as the geometric form of the cleared right-of-way would be consistent with existing development.

Furthermore, through successful reclamation, these effects would continue to diminish over the long term. No RFFAs are anticipated to occur in this area. Of the 35,081 acres within the trail-specific study corridor, approximately 3.3 percent would be directly modified by past, present, and RFFAs with the Project affecting less than 1 percent of this area. Beyond the 6-mile-wide study corridor associated with Project additive cumulative effects, additional impacts would occur where past, present, and RFFA (refer to Tables 4-148 and 4-149 and tMV-18) would be located adjacent to the four NHTs influencing the trail's setting.

4.4.8.3.3.2 Sublette Cutoff Historic Trail

The Sublette Cutoff Historic Trail is not in proximity to Segment 3 of the Project; therefore, no cumulative effects are anticipated in this area.

4.4.8.3.3.3 Continental Divide NST

Cumulative effects on the CDNST in this segment of the Project are similar to those described for Segment 2.

4.4.9 Native American Concerns

4.4.9.1 Issues Identified

As stated in Section 4.4.3, cultural resources are subject to attrition as cultures change and sites weather and erode. In addition, prior development in the region has either degraded or resulted in the loss or discovery of some cultural resources. The addition of the Project to past and present actions and RFFAs would result in a greater potential for effects on locations and resources of Native American concern, including potential TCPs, human remains, natural resources, and cultural landscapes throughout the Project study area. Cumulative effects on locations and resources of Native American concern, including potential TCPs, would also occur over the life of the Project and other current and future projects, including direct effects during construction and indirect effects during operation and maintenance activities. Disturbances from future developments and ground-disturbing activities could uncover or destroy unrecorded sites of potential tribal importance, including potential TCPs. Future actions proposed on federal and/or state lands would require consultation with affected Native American tribes, evaluation of cultural resources, and mitigation of affected significant resources prior to Project implementation. Developments solely on private land are exempt from this requirement.

4.4.9.2 Existing Conditions

The affected environment describes the baseline conditions for cultural resources (refer to Section 3.2.2).

4.4.9.3 Results

Past and present actions and RFFAs within the Project study area for Native American concerns and cultural resources of potential tribal importance include:

Past and Present Projects

- Rands Butte Gas Development Project
- Jonah Infill Drilling Project

Reasonably Foreseeable Future Actions

- Bird Canyon Field Infill Project
- Normally Pressured Lance Natural Gas Development Project

- Continental Divide-Creston Natural Gas Project
- Moneta Divide Natural Gas and Oil Development Project EIS (formerly GMI)

4.4.9.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Cumulative effects from direct adverse effects associated with the construction and operation phase of the Project are likely in this portion of the study area. Locations and resources of cultural, traditional, or spiritual importance to tribes could be destroyed by construction activities and ancillary facilities development. Development of new access corridors and rights-of-way could increase access to previously inaccessible areas, leading to potential vandalism of these resources. There also could be cumulative effects from indirect effects in the form of introduced visual, atmospheric, and audible elements that could detract from the cultural importance of potential TCPs or other properties of traditional or spiritual importance to tribes. These indirect effects also could adversely affect historic properties or sites that have the potential to be listed in the NRHP. The introduction of additional development could alter the setting and feeling of historic properties.

As a result of the presence of existing development projects and proposed future actions, locations and resources of Native American concern that may be encountered could be affected negatively throughout the Project study area.

The addition of the Project to past and present actions and RFFAs would result in a greater potential for cumulative effects on locations and resources of Native American concern or other resources that may be of interest to the tribes. Some of these resources are:

- Prehistoric and historic rock art sites, prehistoric stone circles/rock alignments, prehistoric rock cairns, and burial sites
- Chimney Butte landscape
- Potential TCPs
- The Green River (crossing of the river)
- Streams, creeks or underground aquifers
- Natural resources (e.g., greater sage-grouse and other wildlife and their habitats, ethnobotanical resources)
- Plant-gathering locations and hunting areas

The extent of cumulative effects on locations and resources of Native American concern (including potential TCPs) could be reduced significantly through avoidance and implementation of agency-required mitigation measures. Potential impacts on these locations and resources in the area would be incremental; however, it may be possible to avoid, minimize or mitigate such impacts. There will be indirect cumulative effects on locations and resources of Native American concern as a result of increased public access. The extent of these impacts is unknown.

4.4.9.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

The addition of the Project to past and present actions and RFFAs would result in a greater potential for cumulative effects on locations and resources of Native American concern or other resources that may be of interest to the tribes. Some of these resources are:

- Prehistoric habitation sites, possible lodge sites, burial sites, and the NRHP-listed Arapahoe and Lost Creek Site (48SW4882)
- The Boars Tusk and its surrounding areas

- The West Sand Dunes Archaeological District and Greater Sand Dunes ACEC (refer to Section 4.4.17)
- Potential TCPs
- Natural resources (e.g., greater sage-grouse and other wildlife and their habitats, ethnobotanical resources)
- Rivers, streams, creeks or underground aquifer
- Plant-gathering locations and hunting areas

For the Greater Sand Dunes ACEC, there is a high potential for encountering numerous unrecorded cultural resources that may be relevant to the tribes.

As previously stated, the proximity of the Project to the Boars Tusk is a serious concern for the tribes. The tribes have expressed specific concern regarding public access and the impact of recreational use (e.g., climbing). Micro-siting may not be an appropriate action because the surrounding landscape is of importance to the tribes; however, the tribes would be consulted regarding micro-siting options. As described in the direct and indirect effects discussions, the character of this area has been modified by oil and gas operations and other industrial development.

Cumulative effects on locations and resources of Native American concern associated with Segment 2 would be similar to those effects outlined for Segment 1.

4.4.9.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

The addition of the Project to past and present actions and RFFAs would result in a greater potential for cumulative effects on locations and resources of Native American concern or other resources that may be of interest to the tribes. Some of these resources are:

- Prehistoric rock cairns, prehistoric stone circles/rock alignments, prehistoric habitations, possible lodge sites, and burial sites
- Sites associated with the Cedar Ridge TCP
- Potential TCPs
- Natural resources (e.g., greater sage-grouse and other wildlife and their habitats, ethnobotanical resources)
- Rivers, streams, creeks or underground aquifer
- Plant-gathering locations and hunting area

The pipeline and Moneta Divide Natural Gas and Oil developments will have cumulative effects on the Cedar Ridge TCP. The Project will have cumulative effects on sites that the tribes have said are related to the Cedar Ridge TCP (especially for Alternative 3A: Proposed Action, although cumulative effects would also pertain to sites on Alternative 3B: Lost Creek to Lost Cabin, even though the Project would be in an existing utility corridor). This is very important when considering the cumulative effects on the larger landscape that is important to the tribes.

Cumulative effects on locations and resources of Native American concern associated with Segment 3 would be similar to those effects outlined for Segment 1.

4.4.10 Noise

4.4.10.1 Issues Identified

Potential cumulative effects on noise include conflicts with existing noise-sensitive receptors, including residences, recreation areas, fishing access sites, campgrounds, schools, churches, WSAs, greater sage-

grouse, and other noise-sensitive wildlife, such as raptors and big game species. These impacts would be intensified where other existing actions have already affected noise levels or an RFFA is proposed in the same area.

4.4.10.2 Existing Conditions

The Affected Environment describes the existing ambient (baseline) conditions for noise (refer to Chapter 3, Section 3.2.9).

4.4.10.3 Results

Potential noise cumulative effects were assessed qualitatively, based on the direct and indirect effects evaluation provided in Section 4.3.9 and the RFFAs.

4.4.10.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Pipeline and Riley Ridge Sweetening Plant construction and maintenance activities will cause only short-term noise effects, and were not evaluated for cumulative impacts.

The Project predicted noise levels of the Riley Ridge Sweetening Plant operations are listed in Table 4-70. RFFAs located within 4.0 miles of the Riley Ridge Sweetening Plant include the following:

- Bird Canyon Field Infill Project EIS
- Dry Piney Deep Project
- Normally Pressured Lance Natural Gas Development Project EIS
- Existing pipelines, transmission lines, roads, and railroads

The types of potential effects on noise are the same as those identified in Section 4.3.9.2. Noise levels will increase locally depending on where RFFAs put their noise generating equipment, such as extraction wells or central gathering facilities. Table 3-70 in Section 3.2.9 lists sound levels for typical oil and gas equipment.

4.4.10.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

After construction, no long-term Project noise sources are proposed in Segment 2. Therefore, no cumulative effects are anticipated in this area.

4.4.10.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

After construction, no long-term Project noise sources are proposed in Segment 3. Therefore, no cumulative effects are anticipated in this area.

4.4.11 Lands with Wilderness Characteristics

4.4.11.1 Issues Identified

Potential cumulative effects on lands with wilderness characteristics would result from Project activities crossing areas with wilderness characteristics and potential incompatible uses. These impacts would be intensified where other existing actions have already affected lands with wilderness characteristics or where an RFFA is proposed in the same area.

4.4.11.2 Existing Conditions

Section 3.2.10 describes the baseline conditions for lands with wilderness characteristics.

4.4.11.3 Results

Cumulative impacts on North Pacific Creek (Unit WY040-2011-059) would include the potential for short-term impacts from human presence along the southern portion of the unit during construction and maintenance activity. Long-term impacts on solitude and evidence of human presence would be minimal because the distribution lines would either be buried or eliminated through use of solar power. The remaining portion of this unit would remain intact.

No other impacts on lands with wilderness characteristics are anticipated from past or present actions or other RFFAs.

4.4.12 Paleontological Resources

4.4.12.1 Issues Identified

Potential cumulative effects on paleontological resources include potential crossing of areas containing moderate to very high PFYCs (PFYC 3, 4, and 5). These geologic units range from small exposed areas to larger formations that include several states. Some of the geologic units are known to have contained paleontological resources. These impacts would be intensified where other existing actions have already affected paleontological resources or where an RFFA is proposed.

4.4.12.2 Existing Conditions

Areas of the Project having geologic units with a PFYC of 5 (very high), PFYC of 4 (high), and PFYC of 3 (moderate) occur in the CIAA. Paleontological resources can be affected directly by disturbance of buried, in-situ fossils as a result of any ground-disturbing activities within geologic units with PFYCs of 3, 4, or 5 that could occur during the construction phase of the Project and during other RFFAs.

The presence of fossils in geologic units with a PFYC of 2 (low) is rare and usually represents accidental discoveries. Thus, cumulative effects on those geologic units with a PFYC of 2 would be extremely low. The presence of fossils in geologic units with a PFYC of 1 is also very low. Geologic units having a PFYC of 1 are typically igneous or metamorphic or are older than Precambrian and are not likely to contain recognizable fossil remains. Thus, there would be no cumulative effects on geologic units with a PFYC of 1.

4.4.12.3 Results

Past and present actions and other RFFAs in the CIAA for paleontological resources include:

Past and Present Projects

- Rands Butte Gas Development Project
- Luman Rim Natural Gas Development Project
- BTA Oil Producers Bravo Field Development
- Eden Ranch Exploratory Oil and Gas Lease
- Fontenelle Natural Gas Infill Drilling Project
- Nitchie Gulch Field
- Riley Ridge Unit Development
- Texaco's Stagecoach Draw Unit
- Existing pipelines, transmission lines, roads, and railroads

Reasonably Foreseeable Future Actions

- Bird Canyon Field Infill Project
- Normally Pressured Lance Natural Gas Development
- Sheep Mountain Uranium Project
- Moneta Divide Natural Gas and Oil Development

The cumulative effects summary for paleontological resources is presented in Table 4-167 through Table 4-169 by PFYC.

Table 4-167
Cumulative Effects Summary for PFYC-3

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percent of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	0	0	0	0	0.0
1A Variation: Dry Basin Draw	0	0	0	0	0.0
1B: Dry Piney	0	0	0	0	0.0
1C: Figure Four	0	0	0	0	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	19,703	8	1,180	18,524	<1
2B: Southern Route	26,253	12	1,382	24,871	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	45,324	13	2,210	43,115	<1
3B: Lost Creek to Lost Cabin	27,976	4	1,773	26,203	<1
3C: Lost Creek to Highway 20/26	32,574	4	2,179	30,396	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-168
Cumulative Effects Summary for PFYC-4

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percent of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	0	0	0	0	0.0
1A Variation: Dry Basin Draw	0	0	0	0	0.0
1B: Dry Piney	0	0	0	0	0.0
1C: Figure Four	0	0	0	0	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	3,804	3	189	3,615	<1
2B: Southern Route	3,804	3	189	3,615	<1

Table 4-168 Cumulative Effects Summary for PFYC-4					
Alternative Route	**Total Available Resource (acres)**	**Incremental Project Development (acres)**	**Estimated Cumulative Development (acres)**	**Remaining Resource (acres)**	**Percent of Project Impacts**
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	1,354	0	24	1,331	<1
3B: Lost Creek to Lost Cabin	133	0	3	130	<1
3C: Lost Creek to Highway 20/26	133	0	3	130	<1
NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.					

Table 4-169 Cumulative Effects Summary for PFYC-5					
Alternative Route	**Total Available Resource (acres)**	**Incremental Project Development (acres)**	**Estimated Cumulative Development (acres)**	**Remaining Resource (acres)**	**Percent of Project Impacts**
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	29,522	15	888	28,634	<1
1A Variation: Dry Basin Draw	29,871	16	915	28,956	<1
1B: Dry Piney	34,413	14	2,898	31,515	<1
1C: Figure Four	39,058	13	9,792	29,267	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	116,852	71	4,111	112,742	<1
2B: Southern Route	97,780	56	2,110	95,670	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	38,735	17	1,228	37,507	<1
3B: Lost Creek to Lost Cabin	34,691	10	2,425	32,266	<1
3C: Lost Creek to Highway 20/26	133	0	3	130	<1
NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.					

The types of effects on paleontological resources would be the same as those described in Section 4.3.11.2. The percentage of the incremental Project contribution to cumulative effects on paleontological resources would be less than 1 percent regardless of the alternative route selected. Various past and present actions and RFFAs would occur in the CIAA. Cumulative development on these geologic units with a PFYC of 5 would be the greatest if either Alternative 1B: Dry Piney or Alternative 1C: Figure Four were selected in Segment 1 of the CIAA.

4.4.13 Public Health and Safety

4.4.13.1 Issues Identified

Cumulative effects on public health and safety include the potential for increase in solid and/or hazardous waste in the CIAA. These impacts would be intensified where other existing actions have already affected the public health and safety or where an RFFA is proposed in the same area.

4.4.13.2 Existing Conditions

The affected environment describes the baseline conditions for public health and safety (refer to Section 3.2.12).

4.4.13.3 Results

The types of effects on public health and safety would be the same as those described in Section 4.3.12.2. Cumulative effects are associated with the potential for hazards associated with management of solid and hazardous waste generation and transport and disposal of hazardous materials. There would be minimal cumulative effects on public health and safety as a result of solid waste or hazardous waste management. The current conditions within the geographic scope of the analysis do not exhibit significant effects that are the result of past activities. Project construction and operational activities would occur over defined and controlled areas. The defined temporal and geographic nature of this activity will promote proper management of waste generation and proper transport and disposal in compliance with applicable regulations, which will mitigate contributions to cumulative effects. Long-term cumulative impacts may occur from the increase in solid and hazardous waste materials generated from operation and maintenance of the Riley Ridge Sweetening Plant. Cumulative impacts include increased risk of spill due to transport of materials to and from the Riley Ridge Sweetening Plant over the life of the Project and a decrease in availability for other projects to use hazardous material disposal facilities.

4.4.14 Recreation

4.4.14.1 Existing Conditions

The Affected Environment describes the baseline conditions for recreation (refer to Section 3.2.13).

4.4.14.2 Results

The geographic and temporal scopes defined for this analysis are presented in Table 4-150. The types of potential effects to recreation are the same as those identified in Section 4.3.13.2. This analysis relies on the analysis of direct and indirect impacts from the Project and considers them in conjunction with the past and present actions and RFFAs. Potential cumulative effects on the visual resources (i.e., scenery and views) are addressed in 4.4.20. Also, impacts on National Trails Systems are discussed in Section 4.4.8. A list of past and present projects and RFFAs within the CIAA for recreation follows:

Past and Present Projects

- Hay Reservoir Unit Natural Gas Infill Development
- HS Resources, Inc., Natural Gas Exploration Project
- Eden Ranch Exploratory Oil and Gas Lease
- Lost Creek Uranium ISR Project
- Pinedale Anticline
- Rands Butte Gas Development Project
- Riley Ridge Unit Development Project
- Luman Rim Natural Gas Development Project
- BTA Oil Producers Bravo Field Development

- Fontenelle Natural Gas Infill Drilling Project
- Nitchie Gulch Field
- Kennecott - Sweetwater Uranium Recovery Facility
- Texaco's Stagecoach Draw Unit
- Existing pipelines, transmission lines, roads, and railroads

Reasonably Foreseeable Future Actions

- Bird Canyon Field Infill Project
- Continental Divide-Creston Natural Gas Project
- Dry Piney Deep Project
- Lost Creek Uranium Proposed ISR Project
- Monell-Arch Oil and Gas Development
- Normally Pressured Lance Natural Gas Development Project
- Sheep Mountain Uranium Project
- Moneta Divide Natural Gas and Oil Development Project (formerly GMI)

Table 4-170 through Table 4-172 summarize the cumulative effects on recreation trails, OHV areas, SRMAs, and ERMAs.

Table 4-170
Cumulative Effects Summary for Recreation Trails

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	0	0	0	0	0.0
1A Variation: Dry Basin Draw	0	0	0	0	0.0
1B: Dry Piney	0	0	0	0	0.0
1C: Figure Four	0	0	0	0	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	195	0	13	181	<1
2B: Southern Route	195	0	13	181	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	0	0	0	0	0.0
3B: Lost Creek to Lost Cabin	0	0	0	0	0.0
3C: Lost Creek to Highway 20/26	0	0	0	0	0.0

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-171
Cumulative Effects Summary for Off-Highway Vehicle Areas

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	20,507	12	776	19,731	<1
1A Variation: Dry Basin Draw	21,005	12	788	20,217	<1
1B: Dry Piney	23,303	8	2,169	21,134	<1
1C: Figure Four	27,283	7	9,472	17,811	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	42,931	23	1,533	41,398	<1
2B: Southern Route	39,501	11	1,132	38,369	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	0	0	0	0	0.0
3B: Lost Creek to Lost Cabin	0	0	0	0	0.0
3C: Lost Creek to Highway 20/26	0	0	0	0	0.0

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-172
Extensive Recreation Management Areas and
Special Recreation Management Areas Cumulative Effects Summary

Name	Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percent of Project Impacts
Green Mountain ERMA	2A: Proposed Action	169,382	2	6,223	163,160	<1
	2B: Southern Route	169,382	1	6,223	163,160	<1
	3A: Proposed Action	169,382	1	6,222	163,160	<1
	3B: Lost Creek to Lost Cabin	169,382	1	6,222	163,160	<1
	3C: Lost Creek to Highway 20/26	169,382	1	6,222	163,160	<1
Continental Divide National Scenic Trail ERMA	2A: Proposed Action	5,224	0	191	5,033	<1
	2B: Southern Route	5,224	0	191	5,033	<1
Lander ERMA	2A: Proposed Action	1,226,499	6	24,969	1,201,530	<1
	2B: Southern Route	1,226,499	6	24,969	1,201,530	<1

Table 4-172
Extensive Recreation Management Areas and
Special Recreation Management Areas Cumulative Effects Summary

Name	Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percent of Project Impacts
Lander ERMA	3A: Proposed Action	1,226,499	8	24,971	1,201,528	<1
	3B: Lost Creek to Lost Cabin	1,226,499	13	24,976	1,201,522	<1
	3C: Lost Creek to Highway 20/26	1,226,499	9	24,971	1,201,527	<1
Western ERMA	2A: Proposed Action	465,801	8	18,842	446,959	<1
	2B: Southern Route	465,801	8	18,842	446,959	<1
	3A: Proposed Action	544	0	9	535	0.0
	3B: Lost Creek to Lost Cabin	544	0	9	535	0.0
	3C: Lost Creek to Highway 20/26	544	0	9	535	0.0
Continental Divide National Scenic Trail SRMA	2A: Proposed Action	135,384	2	3,244	132,141	<1
	2B: Southern Route	135,384	2	3,244	132,141	<1
	3A: Proposed Action	135,384	2	3,243	132,141	<1
	3B: Lost Creek to Lost Cabin	135,384	2	3,243	132,141	<1
	3C: Lost Creek to Highway 20/26	135,384	2	3,243	132,141	<1
Green and New Fork Rivers – Lower Zone SRMA	1A: Proposed Action	1,710	0	147	1,563	<1
	1A Variation: Dry Basin Draw	1,710	0	147	1,563	<1
	1B: Dry Piney	1,710	0	147	1,563	<1
National Historic Trails Destination SRMA	3A: Proposed Action	27,142	0	2,067	25,075	<1
	3B: Lost Creek to Lost Cabin	27,142	0	2,067	25,075	<1
	3C: Lost Creek to Highway 20/26	27,142	0	2,067	25,075	<1
National Historic Trail SMRA	3A: Proposed Action	294,632	5	6,499	288,133	<1

Table 4-172
Extensive Recreation Management Areas and
Special Recreation Management Areas Cumulative Effects Summary

Name	Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percent of Project Impacts
National Historic Trail SMRA	3B: Lost Creek to Lost Cabin	294,632	5	6,499	288,133	<1
	3C: Lost Creek to Highway 20/26	294,632	5	6,499	288,133	<1
Oregon Mormon Pioneer California SMRA	2A: Proposed Action	531	0	144	387	<1
	2B: Southern Route	531	0	144	387	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

4.4.14.2.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

4.4.14.2.1.1 Recreation Areas

The types of effects on public health and safety would be the same as those described in Section 4.3.12.2. Potential effects include crossing recreation areas with restrictions limiting future utility development thereby setting the precedent for new corridors in the recreation management areas. These impacts would be intensified where other existing actions have already affected a management area or an RFFA is proposed in the same area, which may result in the area not being managed for its originally intended purpose. The short-term cumulative effects of the Project and past and present actions would potentially limit and/or alter access to the SRMAs or ERMAs and increase noise during construction. The long-term cumulative effects would be additional industrial development in the areas, which potentially could limit some recreation opportunities. Quantitative analysis of cumulative effects on ERMAs and SRMAs is shown in Table 4-171, affecting less than 1 percent of the total acres for each ERMA and SRMA in the Project cumulative analysis study area, regardless of the route selected.

4.4.14.2.1.2 Recreation Trails

No recreation trails were identified as being affected in Segment 1 by the Proposed Action or any of the alternative routes considered. Thus, the Project would not contribute to cumulative effects on recreation trails.

4.4.14.2.1.3 Off-Highway Vehicle and Other Motorized Trails

Cumulative effects on OHV and other motorized trails would be low and effects are anticipated to be similar to direct and indirect effects. Quantitative analysis of cumulative effects on OHV areas is shown in Table 4-171, affecting less than 1 percent of the total acres in the Project cumulative analysis study area, regardless of the route selected. However, the extent of cumulative effects would be lower if either Alternative 1A: Proposed Action or 1A Variation: Dry Basin Draw were selected. Refer to Section 4.3.13.5 for additional information.

4.4.14.2.1.4 Scenic Byways and Backways

For a discussion of cumulative effects on scenic byways and backways, refer to Section 4.4.20. Direct and indirect effects on scenic byways and backways are discussed in 4.3.13.5.

4.4.14.2.1.5 Recreation Opportunity Spectrum

Cumulative effects on the ROS would be similar to direct and indirect effects discussed in Section 4.3.13.5. Potential cumulative effects include diminished opportunity to interact with the natural environment and increased interaction with other users because of permanent, above-ground facilities and improved access to the area.

4.4.14.2.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

4.4.14.2.2.1 Recreation Areas

Cumulative effects on recreation areas in Segment 2 would be similar to the cumulative effects discussed for Segment 1.

4.4.14.2.2.2 Recreation Trails

The Project would not contribute incrementally to cumulative effects on recreation values on the CDNST, as the Project would be underground with no permanent facilities above ground and the entire right-of-way would be reclaimed. A quantitative summary of cumulative effects on recreation trails is shown in Table 4-170. The short-term cumulative effects of the Project crossing the trail, in addition to the past and present actions and an RFFA, could limit the access to the trail during construction. Long-term effects on the trail would not be anticipated. For a discussion of cumulative effects on NHTs, refer to Section 4.4.8.

4.4.14.2.2.3 Off-Highway Vehicle and Other Motorized Trails

Cumulative effects on OHVs would be low and effects would be anticipated to be similar to the direct and indirect effects. Quantitative analysis of cumulative effects on OHV areas is shown in Table 4-171, affecting less than 1 percent of the total acres in the CIAA, regardless of the route selected. The extent of cumulative effects would vary little between Alternative 2A: Proposed Action and Alternative 2B: Southern Route. Refer to Section 4.3.13.5 for additional information.

4.4.14.2.2.4 Scenic Byways and Backways

For a discussion of cumulative effects on scenic byways and backways, refer to Section 4.4.20. Direct and indirect effects on scenic byways and backways are discussed in Section 4.3.13.5.4.

4.4.14.2.2.5 Recreation Opportunity Spectrum

Cumulative effects on the ROS would be similar to the direct and indirect effects discussed in Section 4.3.13.5. Potential cumulative effects include diminished opportunity to interact with the natural environment and increased interaction with other users because of permanent, above-ground facilities and improved access to the area.

4.4.14.2.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

4.4.14.2.3.1 Recreation Areas

Cumulative effects on recreation areas would be similar to the cumulative effects discussed under Segment 1.

4.4.14.2.3.2 Recreation Trails

No recreation trails were identified as being affected in Segment 3 by the Proposed Action or any of the alternative routes considered. Thus, the Project would not contribute to cumulative effects on recreation trails.

4.4.14.2.3.3 Off-Highway Vehicle and Other Motorized Trails

No OHV areas were identified as being affected in Segment 3 by the Proposed Action or any of the alternative routes considered. Thus, the Project would not contribute to cumulative effects on recreation trails.

4.4.14.2.3.4 Scenic Byways and Backways

For a discussion of cumulative effects on scenic byways and backways, refer to Section 4.4.20. Direct and indirect effects on scenic byways and backways are discussed in Section 4.3.13.5.4.

4.4.14.2.3.5 Recreation Opportunity Spectrum

There are no ROS areas within Segment 3 of the Project area; therefore, the Project would not incrementally affect this resource.

4.4.15 Social and Economic Conditions

4.4.15.1 Issues Identified

Cumulative effects on social and economic conditions include possible impacts on available workforce, employment, population, housing, and property values within the CIAA. These impacts would be intensified where other existing actions have already affected social or economic conditions or an RFFA is proposed in the same area.

4.4.15.2 Existing Conditions

The affected environment describes the baseline conditions for social and economic conditions (refer to Section 3.2.14).

4.4.15.3 Results

4.4.15.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

The types of potential effects for social and economic conditions are the same as those identified in Section 4.3.14.2. Construction of the proposed Riley Ridge Treatment Plant and Segment 1 of the proposed pipeline under any of the alternative routes is projected to lead to a short-term increase in employment within Sublette County of a little more than 100 jobs, as described in Section 4.3.13.5. The proposed Bird Canyon Infill Project, which could lead to the development of approximately 348 new natural gas wells in Segment 1, could further increase local employment, earnings, and income in Sublette County. The Bird Canyon Infill Project would have a development period of approximately 10 years (BLM 2014a). Economic projections for that project are not yet publicly available.

Operations and maintenance of the proposed Riley Ridge Treatment Plant and Segment 1 of the pipeline would have smaller, long-term effects on employment, earnings, and economic output in Sublette County. Longer-term economic activity in Sublette County could be further stimulated by the proposed Bird Canyon Infill Project.

As described in Section 4.3.13.5, the Project could lead to a short-term increase in demand for approximately 70 housing units in Sublette County. Development of the Bird Canyon Infill Project could further increase the demand for short-term housing arrangements and other public services in the county.

If the Bird Canyon Infill Project is developed, it would further increase local government revenue from sales and property taxes in Sublette County, in addition to the projected tax revenue from construction and operation of the Project.

As described in Section 4.3.13.5, property values for private lands closest to the Project in Segment 1 could be affected by perceived risks from the operation of that pipeline. Potentially, some of those properties could be further affected by their proximity to natural gas wells that could be developed as part of the proposed Bird Canyon Infill Project. However, the additional economic stimulus provided by both potential projects would likely have an overall positive effect on property values in Sublette County.

4.4.15.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

The types of potential effects for social and economic conditions are the same as those identified in Section 4.3.14.2. Development of the proposed pipeline under any of the alternative routes is projected to lead to a short-term increase in employment within Sublette and Sweetwater counties of approximately 200 jobs, as described in Section 4.3.13.5. Local employment, earnings, and output in these two counties could be stimulated to a much larger extent by the proposed Continental Divide-Creston Natural Gas Project and the proposed Normally Pressured Lance Natural Gas Development Project. In combination, these two RFFAs could involve development of more than 12,000 new natural gas wells, though some of the wells that would be developed under the Continental Divide-Creston Natural Gas Project would be in Carbon County.

Projected economic effects from the Normally Pressured Lance Natural Gas Development Project are not yet publicly available. The Continental Divide-Creston Natural Gas Project (anticipated to involve the development of nearly 9,000 natural gas wells) is projected to lead to an increase in regional employment of 3,000 to 4,000 jobs between year 7 and year 15 of project development. About 70 percent of these jobs are projected to be in Sweetwater County (BLM 2012a).

As described in Section 4.3.13.5, the Project could lead to a short-term increase in population and demand for approximately 80 housing units in Sublette and Sweetwater counties. Development of the Continental Divide-Creston Natural Gas Project and/or the Normally Pressured Lance Natural Gas Development Project could lead to much larger increases in population and demand for short-term (and longer-term) housing in the two counties. While no projections are available at this time for the proposed Normally Pressured Lance Natural Gas Development Project, the Continental Divide-Creston Natural Gas Project is projected to lead to an increase in Sweetwater County population of more than 3,000 residents by the end of the 15-year development period (BLM 2012a).

If either the Normally Pressured Lance Natural Gas Development Project or the Continental Divide-Creston Natural Gas Project is developed, or if both are developed, they would likely lead to much greater increases in the demand for public services in Sublette and Sweetwater counties than would result from the Project. The RFFAs would, however, also lead to substantial increases in local government revenues from property taxes and sales taxes.

4.4.15.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

The types of potential effects for social and economic conditions are the same as those identified in Section 4.3.14.2. Development of the proposed pipeline under any of the alternative routes is projected to lead to a short-term increase in employment within Fremont and Natrona counties of approximately 125 jobs, as described in Section 4.3.13.5. Local employment, earnings, and output in these two counties could be further stimulated by the proposed Moneta Divide Natural Gas and Oil Development Project and the proposed Sheep Mountain Uranium Project.

Projected economic effects from the Moneta Divide Natural Gas and Oil Development Project are not yet publicly available. The Sheep Mountain Uranium Project is projected to have a peak workforce of about 217 workers between year 6 and year 16 of the Project (BLM 2015e).

As described in Section 4.3.13.5, the Project could lead to a short-term increase in population and demand for approximately 50 housing units in Fremont and Natrona counties. Development of the Moneta Divide Natural Gas and Oil Development Project and/or the Sheep Mountain Uranium Project could lead to additional increases in population and demand for short-term (and longer-term) housing in the two counties.

If either the Moneta Divide Natural Gas and Oil Development Project or the Sheep Mountain Uranium Project is developed, or if both are developed, they would likely lead to further increases in the demand for public services in Fremont and Natrona counties. Either of the RFFAs would, however, also lead to increases in local government revenues from property taxes and sales taxes.

4.4.16 Soils and Reclamation

4.4.16.1 Issues Identified

Cumulative impacts on soils and reclamation include the potential for damage to soils and an increased susceptibility to erosion from Project construction and operations. This impact would be intensified where other existing actions have already affected soils or an RFFA is proposed in the same area.

4.4.16.2 Existing Conditions

Soils with moderate and high susceptibility to wind erosion, water erosion, and compaction exist throughout all alternative routes. No prime or unique farmlands were identified within the alternative routes resulting in no cumulative effects on farmlands.

4.4.16.3 Results

The types of effects on soils and reclamation would be the same as those described in Section 4.3.14.2. Cumulative effects on soil resources can result from (1) alterations to the natural environment and land surface that could increase the rate of soil erosion by water or wind and (2) reduction of soil productivity by compaction or improper handling of topsoil. The implementation of agency-required mitigation measures would minimize short-term impacts on the Project area, such as disturbance of surface soils and other alterations to the natural environment stemming from construction of the Project, other past and present projects, and RFFAs, such that the local resources would be stabilized or returned to a state close to their preconstruction state. Long-term impacts would be associated with soils that have low reclamation potential or require intense reclamation efforts.

Past, present, and RFFAs for soil resources include:

Past and Present Projects

- Rands Butte Gas Development Project
- Luman Rim Natural Gas Development Project
- BTA Oil Producers Bravo Field Development
- Eden Ranch Exploratory Oil and Gas Lease
- Fontenelle Natural Gas Infill Drilling Project
- Nitchie Gulch Field
- Riley Ridge Unit Development Project
- Texaco's Stagecoach Draw Unit
- Existing pipelines, transmission lines, roads, and railroads

Reasonably Foreseeable Future Actions

- Bird Canyon Field Infill Project
- Normally Pressured Lance Natural Gas Development
- Sheep Mountain Uranium Project
- Moneta Divide Natural Gas and Oil Development

Table 4-173 through Table 4-180 describe the cumulative effects for soils and reclamation resources.

Table 4-173
Cumulative Effects Summary for Soils with High Susceptibility to Water Erosion

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	3,165	3	148	3,017	<1
1A Variation: Dry Basin Draw	3,165	3	148	3,017	<1
1B: Dry Piney	4,494	3	924	3,570	<1
1C: Figure Four	2,445	0	1,171	1,274	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	1,089	0	117	972	<1
2B: Southern Route	30	0	0	30	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	2,413	1	59	2,355	<1
3B: Lost Creek to Lost Cabin	4,415	0	273	4,142	<1
3C: Lost Creek to Highway 20/26	6,397	0	412	5,985	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-174
Cumulative Effects Summary for Soils with Moderate Susceptibility to Water Erosion

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	11,496	7	434	11,061	<1
1A Variation: Dry Basin Draw	11,296	7	423	10,873	<1
1B: Dry Piney	13,681	6	540	13,141	<1
1C: Figure Four	11,559	5	1,171	10,389	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	13,509	5	797	12,713	<1
2B: Southern Route	15,357	10	466	14,891	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	29,688	10	1,073	28,616	<1
3B: Lost Creek to Lost Cabin	26,943	6	1,544	25,399	<1
3C: Lost Creek to Highway 20/26	27,106	3	1,576	25,530	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-175
Cumulative Effects Summary for Soils with Low Susceptibility to Water Erosion

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	1,804	1	62	1,742	<1
1A Variation: Dry Basin Draw	1,804	1	62	1,742	<1
1B: Dry Piney	1,167	1	50	1,117	<1
1C: Figure Four	2,150	1	451	1,699	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	2,561	1	143	2,418	<1
2B: Southern Route	1,926	0	90	1,836	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	1,446	0	88	1,357	<1
3B: Lost Creek to Lost Cabin	2,766	0	215	2,551	<1
3C: Lost Creek to Highway 20/26	4,825	0	356	4,469	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-176
Cumulative Effects Summary for Soils with High Susceptibility to Wind Erosion

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	3,679	2	170	3,509	<1
1A Variation: Dry Basin Draw	3,679	1	169	3,510	<1
1B: Dry Piney	6,273	1	969	5,304	<1
1C: Figure Four	9,487	2	4,401	5,086	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	6,863	3	288	6,575	<1
2B: Southern Route	4,204	1	188	4,016	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	5,389	2	211	5,178	<1
3B: Lost Creek to Lost Cabin	11,823	3	649	11,173	<1
3C: Lost Creek to Highway 20/26	20,238	2	1,384	18,854	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-177
Cumulative Effects Summary for Low Susceptibility to Wind Erosion

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	18,789	10	850	17,940	<1
1A Variation: Dry Basin Draw	19,133	9	854	18,279	<1
1B: Dry Piney	21,006	9	1,573	19,433	<1
1C: Figure Four	20,962	6	3,838	17,124	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	13,697	5	1,060	12,637	<1
2B: Southern Route	26,562	18	661	25,901	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	31,385	11	1,518	29,868	<1
3B: Lost Creek to Lost Cabin	24,156	5	1,506	22,650	<1
3C: Lost Creek to Highway 20/26	26,756	4	1,814	24,942	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-178
Cumulative Effects Summary for Moderate Susceptibility to Wind Erosion

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	13,021	8	600	12,420	<1
1A Variation: Dry Basin Draw	13,120	9	606	12,514	<1
1B: Dry Piney	12,682	7	1,562	11,120	<1
1C: Figure Four	14,664	6	4,326	10,338	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	47,614	24	2,988	44,626	<1
2B: Southern Route	21,803	9	773	21,030	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	65,341	24	3,087	62,255	<1
3B: Lost Creek to Lost Cabin	54,718	15	3,900	50,818	<1
3C: Lost Creek to Highway 20/26	77,526	11	5,727	71,799	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-179
Cumulative Effects Summary for Soils with High Clay Content

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	15,744	10	723	15,020	<1
1A Variation: Dry Basin Draw	15,544	10	712	14,832	<1
1B: Dry Piney	17,246	10	1,593	15,653	<1
1C: Figure Four	13,923	5	2,214	11,709	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	12,276	5	808	11,467	<1
2B: Southern Route	10,288	7	344	9,944	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	32,542	11	1,140	31,403	<1
3B: Lost Creek to Lost Cabin	25,599	6	1,492	24,107	<1
3C: Lost Creek to Highway 20/26	27,437	3	1,647	25,791	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-180 Cumulative Effects Summary for Soils with Low Clay Content					
Alternative Route	**Total Available Resource (acres)**	**Incremental Project Development (acres)**	**Estimated Cumulative Development (acres)**	**Remaining Resource (acres)**	**Percentage of Project Impacts**
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	24,067	9	1,434	22,633	<1
1A Variation: Dry Basin Draw	24,710	10	1,455	23,255	<1
1B: Dry Piney	28,057	8	3,583	24,474	<1
1C: Figure Four	36,025	9	11,440	24,585	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	153,473	89	5,655	147,817	<1
2B: Southern Route	165,383	83	4,675	160,708	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	75,153	26	4,211	70,942	<1
3B: Lost Creek to Lost Cabin	69,026	18	5,068	63,958	<1
3C: Lost Creek to Highway 20/26	103,553	15	8,005	95,548	<1
NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.					

4.4.16.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

4.4.16.3.1.1 Soil Resources

The types of effects on soils and reclamation would be the same as those described in Section 4.3.14.2. Cumulative effects on soils with high and moderate susceptibility to wind erosion would be greatest on Alternative 1A: Proposed Action and Alternative 1A Variation: Dry Basin Draw and least on Alternative 1B: Dry Piney and Alternative 1C: Figure Four. Cumulative effects on soils with moderate and high susceptibility to water erosion are greatest on both Alternative 1A: Proposed Action and Alternative 1A Variation: Dry Basin Draw and least on Alternative 1C: Figure Four. Alternative 1C: Figure Four also has the fewest cumulative effects on compaction-prone soils.

4.4.16.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

4.4.16.3.2.1 Soil Resources

The types of effects on soils and reclamation would be the same as those described in Section 4.3.14.2. Cumulative effects on soils with high and moderate susceptibility to wind erosion would be greater on Alternative 2A: Proposed Action than Alternative 2B: Southern Route. However, cumulative effects on soils with moderate and high susceptibility for water erosion are greater on Alternative 2B: Southern Route than Alternative 2A: Proposed Action. Alternative 2B: Southern Route also has more cumulative effects on compaction-prone soils.

4.4.16.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

4.4.16.3.3.1 Soil Resources

The types of effects on soils and reclamation would be the same as those described in Section 4.3.14.2. Cumulative effects on soils with high and moderate susceptibility to wind erosion would be greatest on Alternative 3A: Proposed Action and least on Alternative 3C: Lost Creek to Highway 20/26. Cumulative effects on soils with moderate and high susceptibility to water erosion are greatest for Alternative 3A: Proposed Action and least on Alternative 3C: Lost Creek to Highway 20/26. Alternative 3C: Lost Creek to Highway 20/26 also has the least cumulative effects on compaction-prone soils.

4.4.17 Special Designations

4.4.17.1 Issues Identified

Issues identified are the same as the issues identified in Section 4.3.16 and include potential impacts on relevant and important values and management of ACECs, potential impacts on the wilderness attributes of WSAs, and potential impacts on other management areas.

4.4.17.2 Existing Conditions

The affected environment describes the baseline conditions for special designations (refer to Section 3.2.16).

4.4.17.3 Results

The types of effects on special designations would be the same as those described in Section 4.3.16.2. The geographic and temporal scopes defined for this analysis are presented in Table 4-150. This analysis relies on the analysis of direct and indirect impacts from the Project and considers them in conjunction with the past and present actions and RFFAs in the CIAA, which include:

Past and Present Projects

- Rands Butte Gas Development Project
- Luman Rim Natural Gas Development Project
- BTA Oil Producers Bravo Field Development
- Fontenelle Natural Gas Infill Drilling Project
- Nitchie Gulch Field
- Existing pipelines, transmission lines, roads, and railroads

Reasonably Foreseeable Future Actions

- Normally Pressured Lance Natural Gas Development Project
- Moneta Divide Natural Gas and Oil Development Project (formerly GMI)

Table 4-181 describes the cumulative effects for other management areas.

4.4.17.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

4.4.17.3.1.1 Areas of Critical Environmental Concern

No ACECs are crossed by the alternative routes considered in Segment 1, as discussed in Section 3.2.16. Thus, no cumulative effects would be anticipated.

Table 4-181
Cumulative Effects Summary for Other Management Areas

Name	Management Values	Managing Agency	Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percent of Project Impacts
Steamboat Mountain	Recreation, ecological values, high quality scenery, wildlife viewing	BLM	2A: Proposed Action	95,397	0	602	94,795	<1
			2B: Southern Route	8,119	0	44	8,075	<1
Red Desert Watershed	Recreation, ecological, high quality scenery, wildlife viewing	BLM	2A: Proposed Action	351,616	23	2,721	348,895	<1
			2B: Southern Route		9	2,707	348,909	<1
West Sand Dunes Archaeological District	Archaeological values, education, historic values	BLM	2B: Southern Route	19,834	6	151	19,683	<1
Boars Tusk	Recreation, high quality scenery, educational, geologic values, ecological values	BLM	2B: Southern Route	503	1	1	502	<1
Designated Development Area Number[1]	To facilitate exploration and development of renewable and nonrenewable energy resources.	BLM	3B: Lost Creek to Lost Cabin	247,826	7	17,481	230,344	<1
			3C: Lost Creek to Highway 20/26		1	17,476	230,350	<1
Designated Development Area Number[2]	To facilitate exploration and development of renewable and nonrenewable energy resources.	BLM	3A: Proposed Action	49,154	7	1,003	48,152	<1
			3B: Lost Creek to Lost Cabin		4	1,000	48,154	<1
			3C: Lost Creek to Highway 20/26		4	1,000	48,154	<1
Wind River Management Area	Oil and gas exploration and development	BLM	3C: Lost Creek to Highway 20/26	54,657	0	1,442	53,215	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

4.4.17.3.1.2 Wilderness Study Areas

No WSAs are crossed by the alternative routes considered in Segment 1, as discussed in Section 3.2.16. Thus, no cumulative effects would be anticipated.

4.4.17.3.1.3 Other Management Areas

No other management areas are crossed by the alternative routes considered in Segment 1, as discussed in Section 3.2.16. Thus, no cumulative effects would be anticipated.

4.4.17.3.1.4 Conservation Easements

No conservation easements are crossed by the alternative routes considered in Segment 1, as discussed in Section 3.2.16. Thus, no cumulative effects would be anticipated.

4.4.17.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

4.4.17.3.2.1 Areas of Critical Environmental Concern

No ACECs are crossed by the alternative routes considered in Segment 2, as discussed in Section 3.2.16. Thus, no cumulative effects would be anticipated.

4.4.17.3.2.2 Wilderness Study Areas

No WSAs are crossed by the alternative routes considered in Segment 2, as discussed in Section 3.2.16. Thus, no cumulative effects would be anticipated.

4.4.17.3.2.3 Other Management Areas

Table 4-181 summarizes the cumulative effects on other management areas that would be crossed by the Proposed Action and the alternative routes in Segment 2. Potential effects include crossing management areas with restrictions and limiting future utility development, thereby setting the precedent for new corridors in the management area. These impacts would be intensified where other existing actions have already affected a management area or an RFFA is proposed in the same area. Whether the Project is compounding an existing action or an RFFA, the cumulative effect on the values or resources leading to the designation of a management area could result in the area not being managed for what it was originally intended.

The incremental effect of the Project on the Steamboat Mountain Management Area would be less than 1 percent, regardless of the route selected. While the cumulative effects would be greater if the Proposed Action were selected, the extent of cumulative effects associated with either route would not be anticipated to diminish the values of or resources in the other management areas.

The incremental effect of the Project on the Red Desert Watershed Management Area would be less than 1 percent, regardless of the route selected. While the cumulative effects would be greater if the Proposed Action were selected, the extent of cumulative effects associated with either route would not be anticipated to diminish the values of or resources in the other management areas.

The incremental effect of the Project on the West Sand Dunes Archaeological District would be less than 1 percent for Alternative 2B: Southern Route. The extent of cumulative effects associated with this route would not be anticipated to diminish the values of or resources in the other management areas. There would be no cumulative effects if Alternative 2A: Proposed Action was selected.

The incremental effect of the Project on the Boars Tusk would be less than 1 percent for Alternative 2B: Southern Route. The extent of cumulative effects associated with this route would not be anticipated to diminish the values of or resources in the other management areas. There would be no cumulative effects if Alternative 2A: Proposed Action was selected.

4.4.17.3.2.4 Conservation Easements

No conservation easements are crossed by alternative routes considered in Segment 2, as discussed in Section 3.2.16. Thus, no cumulative effects would be anticipated.

4.4.17.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

4.4.17.3.3.1 Areas of Critical Environmental Concern

No ACECs are crossed by the alternative routes considered in Segment 3, as discussed in Section 3.2.16. Thus, no cumulative effects would be anticipated.

4.4.17.3.3.2 Wilderness Study Areas

No WSAs are crossed by the alternative routes considered in Segment 3, as discussed in Section 3.2.16. Thus, no cumulative effects would be anticipated.

4.4.17.3.3.3 Other Management Areas

Cumulative effects on other management areas in Segment 3 would be similar to those effects discussed under Section 4.3.16 because the Project is compatible with the management of all other management areas crossed, including facilitating development of energy resources, oil and gas exploration, etc.

4.4.17.3.3.4 Conservation Easements

No conservation easements are crossed by the alternative routes considered in Segment 3, as discussed in Section 3.2.16. Thus, no cumulative effects would be anticipated.

4.4.18 Transportation and Access

4.4.18.1 Issues Identified

Cumulative impacts on transportation and access include the potential for alternation to travel systems, conflicts with existing transportation management, and disruption to access. These impacts would be intensified where other existing actions have already affected the transportation system or an RFFA is proposed in the same area.

4.4.18.2 Existing Conditions

The affected environment describes the baseline condition for transportation and access (refer to Chapter 3, Section 3.2.17).

4.4.18.3 Results

This section addresses cumulative effects on transportation and access resulting from the Project in addition to past and present actions and RFFAs. The types of effects on transportation and access would be the same as those described in Section 4.3.17.2. The geographic and temporal scopes of cumulative analysis are presented in Table 4-150.

The geographic scope for transportation and access resources analyzed includes projects within an 11-mile buffer of the Project, identified below:

Past and Present Projects

- Rands Butte Gas Development Project
- Fontenelle Natural Gas Infill Drilling Project
- Hay Reservoir Unit Natural Gas Infill Development Project
- HS Resources, Inc., Natural Gas Exploration Project
- Eden Ranch Exploratory Oil and Gas Lease
- Luman Rim Natural Gas Development Project
- North Nitchie Gulch
- Pinedale Anticline Project
- Riley Ridge Unit Development Project
- Ten Mile Rim Coal Lease-by-Application Project
- BTA Oil Producers Bravo Field Development
- Texaco's Stagecoach Draw Unit
- Jonah Infill Drilling Project
- Existing pipelines, transmission lines, roads, and railroads

Reasonably Foreseeable Future Actions

- Bird Canyon Field Infill Project EIS
- Normally Pressured Lance Natural Gas Development Project EIS
- Continental Divide-Creston Natural Gas Project EIS
- Sheep Mountain Uranium Project EIS
- Moneta Divide Natural Gas and Oil Development Project EIS (formerly GMI)

The Project would not be anticipated to contribute to effects on transportation and access due to implementation of applicable design features for the Proposed Action for environmental protection and agency-required mitigation measures (identified in Section 4.3.17.4). Further, the ongoing operation and maintenance of the Riley Ridge Sweetening Plant would not result in cumulative impacts on transportation and access since this activity would not greatly increase traffic within the transportation system or disrupt existing access throughout the CIAA.

Reclamation and rehabilitation of roads and access points would mitigate any potential impacts associated with the Project.

4.4.19 Vegetation

4.4.19.1 Issues Identified

Cumulative impacts on vegetation would include impacts on vegetation associated with alteration of vegetative communities, removal of sensitive species, and spread of noxious weeds. These impacts would be intensified where other existing actions have already affected vegetation communities or an RFFA is proposed in the same area.

4.4.19.2 Existing Conditions

The affected environment describes the baseline conditions for vegetation (refer to Section 3.2.18).

4.4.19.3 Results

This section addresses cumulative effects on vegetation resources resulting from the Project in addition to past and present actions and RFFAs. The geographic and temporal scopes of analysis are presented in Table 4-150.

The geographic scope for vegetation resources analyzed includes projects within a 2-mile buffer of the Project, identified below:

Past and Present Projects

- Rands Butte Gas Development Project
- Jonah Infill Drilling Project
- Eden Ranch Exploratory Oil and Gas Lease
- Luman Rim Natural Gas Development Project
- BTA Oil Producers Bravo Field Development
- Fontenelle Natural Gas Infill Drilling Project
- Luman Rim Natural Gas Development Project
- Nitchie Gulch Field
- Riley Ridge Unit Development Project
- Texaco's Stagecoach Draw Unit
- Existing pipelines, transmission lines, roads, and railroads

Reasonably Foreseeable Future Actions

- USS Company Railroad
- Burlington Northern Railroad
- Bird Canyon Field Infill Project
- Normally Pressured Lance Natural Gas Development
- Sheep Mountain Uranium Project
- Moneta Divide Natural Gas and Oil Development

4.4.19.3.1.1 Vegetation Communities

The types of effects on vegetation would be the same as those described in Section 4.3.18.2. Most cumulative impacts on vegetation associated with construction of the Project and other RFFAs would occur during construction activities and adjacent to work areas. However, some long-term cumulative effects, such as the introduction and spread of noxious weeds, also could affect a larger geographical context.

4.4.19.3.1.2 Special Status Plant Species

The cumulative effects summary for Ute ladies'-tresses modeled habitat is presented in Table 4-182.

Table 4-182
Cumulative Effects Summary for Potential Ute Ladies'-Tresses Habitat

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	26	0	19	7	<1
1A Variation: Dry Basin Draw	26	0	19	7	<1
1B: Dry Piney	26	0	19	7	<1
1C: Figure Four	127	0	121	7	<1

Table 4-182
Cumulative Effects Summary for Potential Ute Ladies'-Tresses Habitat

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	22	0	5	17	<1
2B: Southern Route	0	0	0	0	0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	578	0	15	563	<1
3B: Lost Creek to Lost Cabin	583	0	15	568	<1
3C: Lost Creek to Highway 20/26	583	0	15	568	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

The Project is not expected to result in disturbance to Ute ladies'-tresses habitat outside of areas previously disturbed or expected to be disturbed by past or present actions or RFFAs, and, thus, the percentage of the incremental Project contribution to cumulative effects on Ute ladies'-tresses would be less than 1 percent for all alternative routes.

Without mitigation, most cumulative impacts on Ute ladies'-tresses associated with construction of the Project or other RFFAs would occur in the immediate geographical area of construction activities. However, some anticipated cumulative effects, such as the introduction and spread of noxious weed species and increased dust deposition, could occur in a larger geographical context as well as in the immediate vicinity of construction activities. The implementation of mitigation measures requiring noxious weed management and dust abatement is expected to limit the potential indirect effects on Ute ladies'-tresses. The Project is expected to incrementally contribute less than 1 percent to cumulative effects on Ute ladies'-tresses habitat, regardless of the alternative route selected. Cumulative development would affect the most acres of Ute ladies'-tresses habitat in Segment 1 of the CIAA; selection of Alternative 1C: Figure Four would have the greatest extent of potential cumulative effects on the species' habitat. On federally administered lands, the short-term cumulative effects of surface-disturbing activities associated with construction of the Project would be avoided or minimized through micro-siting and biological monitoring during construction. It can be assumed that similar mitigation would be required for other actions on federally administered lands.

Sufficient habitat data were not available to quantify cumulative effects on BLM-listed sensitive species.

4.4.20 Visual Resources

4.4.20.1 Issues Identified for Analysis

The development of past and present actions and RFFAs may result in cumulative effects on visual resources due to the modification of scenery, including the landform, vegetation, water, color, and adjacent scenery and viewing locations. The sum of the impacts on these landscapes and viewing locations would result from changes to the existing landform through earthwork and vegetation color, as well as vegetation texture.

4.4.20.1.1.1 Scenery

As described in Section 4.3.19.5 scenery is defined as a continuous unit of land comprising harmonizing features that result in and exhibit a distinct landscape character. A cumulative effect on scenery would result from the industrialization of natural-appearing landscapes through the construction of multiple

projects and the alteration of the existing landscape's characteristics, including modifications to landforms, vegetation, water, colors, adjacent scenery, scarcity, and cultural resources. In general, for those areas where modifications already exist (i.e., existing pipelines, transmission lines, or any other existing utility corridors), effects would be reduced through colocation of Project rights-of-way. In slow-growing vegetation areas, such as sagebrush steppe areas, cumulative effects generally are prolonged as the time for the vegetation to restore to original size and maturity may take several decades. The geographic scope for the scenery portion of the visual resource cumulative effects, as described in Table 4-150, is defined as the BLM SQRUs located partially or completely within 3 miles of the Project (i.e., the area associated with Project-level effects). Cumulative effects on scenery are described by SQRU and consider the entire unit to describe effects, regardless of where views may occur (refer to viewing locations for impacts on views). To determine the extent of influence from past projects, present projects, and RFFAs on scenery, an influence buffer was set from each project (e.g., 3 miles for the Project). By combining these buffers, which showed the extent of each SQRU modified by development and the Project specifically, the relative level of cumulative effects was determined. These methods are similar to the overall Project cumulative effects process, described in Section 0, except that instead of using the footprint associated with each project, a visual influence zone was used for each project. (Note: Some areas within SQRUs include influence from both past and present projects and RFFAs, which are described in the narratives of the result section.)

4.4.20.1.1.2 Viewing Locations

Viewing locations represent areas where the Project would potentially be visible to the public. These locations include travel routes, recreation areas, and special designations. Additional projects, in context with past and present actions and RFFAs, would have a variety of cumulative effects on views due to the alteration of landscapes components, including landforms, vegetation, and structures. Combined utilities, such as transmission lines and other energy facilities, seen in context with the Project would dominate views. In some circumstances, the dominance of projects, if colocated, can be reduced when features are visually similar in shape, color, and size. However, if the aggregate projects are incongruent with one another, the cumulative effects could be greater. The geographic scope for the viewing locations portion of the visual resource cumulative effects is defined as the viewsheds from agency-approved KOP locations. The results for this portion of the cumulative effects analysis are described narratively and were not quantified because the effect on views is based on the level of contrast and distance from the viewing locations. Accordingly, some modifications within the viewshed may occupy large areas but do not stand out due to the distance from the viewer; whereas, other modifications located directly adjacent to the viewer could dominate viewsheds, even if the modifications occupy smaller areas.

4.4.20.1.1.3 Existing Conditions

Residential and industrial development (i.e., cultural modifications) is currently altering the existing landscape character and altering viewsheds in multiple locations throughout the Project area. Following is a summary of the major areas of development by segment.

The character of the Segment 1 area has been altered by cultural modifications, including oil and gas operations, the Riley Ridge Treatment Plant, and other industrial development. In Segment 2, the cultural modifications are minimal and are primarily present as highways and other travel routes, as well as communication facilities. The character of the Segment 3 area has been altered by cultural modifications, such as transmission lines as well as pipelines and development associated with small towns, such as Moneta, Powder River, and Jeffrey City.

4.4.20.2 Results

The types of effects on visual resources would be the same as those described in Section 4.3.19.2. Cumulative effects on visual resources are shown, quantitatively, in Table 4-183. Narrative descriptions

of the cumulative effects, by Project segment, are described in the following sections. For scenery impacts in particular, narrative descriptions are only provided for landscapes where the Project-associated cumulative effects are most intense.

Table 4-183
Cumulative Effects Summary for Scenery

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	1,479,275	19,814	917,285	561,991	1
1A Variation: Dry Basin Draw	1,479,275	19,814	917,285	561,991	1
1B: Dry Piney	1,479,275	21,714	919,185	56,090	1
1C: Figure Four	1,498,077	12,213	925,833	572,244	1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	2,806,125	215,664	1,447,860	1,358,265	8
2B: Southern Route	3,816,680	180,338	2,229,852	1,586,828	5
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	2,460,857	85,472	1,299,538	1,161,319	3
3B: Lost Creek to Lost Cabin	1,643,647	48,062	866,112	777,535	3
3C: Lost Creek to Highway 20/26	2,531,744	64,734	1,384,332	1,147,412	3

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

4.4.20.2.1 Scenery

4.4.20.2.1.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Scenery-related issues, as described in the in Section 4.3.19 discussion of the Project's direct effects, include the following landscapes (SQRUs):

- Big Mesa
- Deer Hills
- LaBarge Spur
- Little Colorado Desert
- Lower Green River
- Lower Green River Cliffs
- Milleson Draw
- N. La Barge
- Piney Creek
- SE Desert
- Sublette Flats
- Wyoming Foothills

Big Mesa

Existing cultural modifications, such as oil and gas developments, have affected the SQRU north of Calpet and La Barge, known as Big Mesa, from the SQRU's southern edge at the Hogsback Ridge to the north edge, which is butted against the Dry Basin. These modifications have changed the natural character of the landscape by introducing a change in vegetation color and patterns created by existing pipeline rights-of-way. Only 16 percent of the total area of this unit has not been influenced by existing development, RFFAs, and the Project (all alternative routes except Alternative 1B: Dry Piney). The Project will affect 7 percent of area that has not been influenced by previous development or RFFAs in this SQRU when compared to the Alternative 1A: Proposed Action. The impacts are similar for Alternatives 1A Variation: Dry Basin Draw and 1C: Figure Four. The impacts of Alternative 1B: Dry Piney are slightly greater and, thus, would further increase the industrialization of the landscape character. Alternative 1B: Dry Piney will affect 16 percent of area that has not been influenced by previous development or RFFAs.

N. LaBarge

The N. LaBarge SQRU lies between Piney Creek and La Barge Creek and outlines the Big Mesa SQRU. An industrialized character has resulted from the heavy influence of existing cultural modification, including oil and gas development. Only 9 percent of the total area has not been influenced by development, RFFAs, and the Project (on Alternative 1A: Proposed Action). Alternative 1A: Proposed Action will affect 10 percent of the area that has not been previously influenced by development or RFFAs. Similar impacts would occur for Alternatives 1A Variation: Dry Basin Draw and 1B: Dry Piney. For Alternative 1C: Figure Four, the additional visual influence would be minimal due to the location of the Project relative to the boundaries of the SQRU.

LaBarge Spur

The LaBarge Spur SQRU has been influenced by existing cultural modification, including oil and gas development. Only 7 percent of the total area has not been influenced by development, RFFAs, and the Project (Alternative 1C: Figure Four). Alternative 1C: Figure Four will affect 8 percent of the area that has not been previously influenced by development or RFFAs in the SQRU. Other Project alternative routes would not impact this SQRU d resulting in less additive impacts on the landscape.

4.4.20.2.1.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Scenery-related issues, as described in the direct effects discussion in Section 4.3.19, include the potential effects on the following landscapes (SQRUs):

- Antelope Hills
- Big Sandy Recreation Area
- Continental Divide
- Crooks Gap
- Crooks Mountain
- Dry Sandy Hills
- Great Divide Basin
- Green Mountain
- Green River Plains
- Jack Morrow Hills
- Little Colorado Desert
- Leucite Hills
- Luman Butte

- Milleson Draw
- Rock Springs Valley
- Sand Dunes
- SE Desert
- Steamboat Mountain
- Stratton Draw
- Sublette Flats
- Tenmile Draw
- The Pinnacles
- White Mountain

Big Sandy Recreation Area

The northern section of Eden Valley, the area around Eden Reservoir, Big Sandy Reservoir, and the Big Sandy River, is known as the Big Sandy Recreation Area SQRU. This landscape has been affected by existing development, such as oil and gas development. Twenty-four percent of the total area of this unit has not been influenced by past or present actions, RFFAs, and the Project (Alternative 2A: Proposed Action). Alternative 2A: Proposed Action would affect 11 percent of the area that has not been influenced by previous development or RFFAs.

Dry Sandy Hills

The area northeast of Farson City and south of the Wind River Range is known as Dry Sandy Hills. It has been influenced by existing cultural modification, such as scattered oil and gas development and communication and transmission lines. Sixty-five percent of the total area of this unit has not been influenced by past or present actions, RFFAs, or the Project (Alternative 2A: Proposed Action). Alternative 2A: Proposed Action would affect 13 percent of the area that has not been influenced by previous development or RFFAs.

Great Divide Basin

The area butted north of the Sand Dunes, bordering the northeast of the Alkali Draw and the Continental Divide, is known as the Great Divide Basin. This landscape has been influenced by existing cultural modification and development, such as transmissions lines and oil and gas developments. Forty-four percent of this unit has not been influenced by past or present actions, RFFAs, and the Project on Alternative 2A: Proposed Action. Alternative 2A: Proposed Action will affect 18 percent of the area that has not been influenced by previous development or RFFAs. For Alternative 2B: Southern Route, 55 percent of the unit has not been influenced by past or present actions, RFFAs, or the Project. Of this 55 percent, the impacts from the Project would be 6 percent of the area that has not been previously influenced by past or present actions or RFFAs. To reduce cumulative effects on the character of this landscape, the landscape would be colocated with other Project rights-of-way reducing the cumulative impacts.

Jack Morrow Hills

The area encompassing the Jack Morrow Hills, known as the Jack Morrow Hills SQRU, is south of the Oregon Buttes, with U.S. Highway 28 running parallel along the northwest boundary of this landscape, and is butted to the northwest of Alkali Draw. This area has been visually affected by cultural modification, such as roads and communication and transmission lines, as well as scattered oil and gas development. Twenty-six percent of this unit has not been influenced by past or present actions, RFFAs, or the Project (Alternative 2A: Proposed Action). Alternative 2A: Proposed Action would influence 39 percent of the area that has not been influenced by previous development or RFFAs. Alternative 2A: Proposed Action would increase the industrialization of the landscape character through the addition of

linear geometric shapes crossing the landscape. This, in turn, will change the vegetation form, color, and texture.

Sublette Flats

The area encompassing Eden City, as well as the south and east parts of Farson Sublette Flats, has been influenced by U.S. highways and county roads, as well as oil and gas development. Although many cultural modifications are found in this landscape, more than half of this unit has not been influenced by past or present actions, RFFAs, or the Project (either Alternative 2A: Proposed Action or 2B: Southern Route), and it appears to be mostly rural. Alternative 2A: Proposed Action would influence 8 percent of the area that has not been previously influenced by development or RFFAs in the SQRU with Alternative 2B: Southern Route influencing 7 percent of the area.

The Pinnacles

The Pinnacles SQRU, east of Bush Rim, has been visually influenced by scattered oil and gas and pipeline rights-of-way. Sixty-five percent of this unit has not been influenced by past or present actions, RFFAs, or the Project (Alternative 2A: Proposed Action). Alternative 2A: Proposed Action will influence 56 percent of the area that has not been influenced by previous development or RFFAs, greatly increasing the visual influence of industrialization. Ninety-four percent of this unit has not been influenced by past or present actions, RFFAs, or Alternative 2B: Southern Route. Alternative 2B: Southern Route would influence only 6 percent of the area that has not been influenced by previous development or RFFAs, greatly reducing the visual quality in comparison to the Alternative 2A: Proposed Action.

Little Colorado Desert

The area encompassing the Little Colorado Desert is known as the Little Colorado Desert SQRU. Although the area has been highly influenced by previous development or RFFAs, the additive effects of Alternative 2A: Proposed Action are negligible. In comparison, only 8 percent of the total area of this unit has not been influenced by existing development, RFFAs, and Alternative 2B: Southern Route. Alternative 2B: Southern Route would affect 21 percent of area that has not been influenced by previous development or RFFAs. Due to the great amount of visual influence due to cultural modifications in the area, the landscape character would not undergo a drastic change in landform or vegetation.

Sand Dunes

The sand dune area separating the Leucite Hills and Steamboat Rim is known as the Sand Dunes SQRU. This area has experienced significant levels of cultural modification, including oil and gas developments and two transmission lines. Only 22 percent of this unit has not been influenced by past or present actions, RFFAs, or Alternative 2B: Southern Route. Due to colocation of past and present actions and RFFAs, Alternative 2B: Southern Route would affect 13 percent of the area that has not been influenced by previous development or RFFAs.

4.4.20.2.1.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Scenery-related issues, as described in the direct Project effects discussion in Section 4.3.19, include the following landscapes (SQRUs):

- Agate Flats
- Badwater
- Beaver Rim
- Coalbank Hills
- Crooks Gap

- Crooks Mountain
- Gas Hills
- Granite Mountains
- Green Mountain
- Lysite Mountains
- Moneta
- Pine Mountain
- Powder River Breaks
- Rattlesnakes
- Signor Ridge
- Sweetwater Plains
- Sweetwater Valley
- Western Natrona

Coalbank Hills

The area west of Natrona and north of Rattlesnake Hills is known as the Coalbank Hills. This area has been influenced by transmission lines and oil and gas developments. Nineteen percent of this unit has not been influenced by past or present actions, RFFAs, or the Project (Alternative 3A: Proposed Action). Alternative 3A: Proposed Action will influence 27 percent of the area that has not been previously influenced by development or RFFAs in the SQRU. Due to the high percentage of area visually influenced in the SQRU and the colocation of the Alternative 3A: Proposed Action with other project rights-of-way, the landscape character will not be noticeably modified by the Project.

Gas Hills

The area north of Beaver Divide and west of Black Mountain is known as the Gas Hills SQRU. The landscape has been influenced by existing cultural modification, such as scattered oil and gas developments. Twenty-four percent of this unit has not been influenced by past or present actions, RFFAs, or the Project (Alternative 3A: Proposed Action). Alternative 3A: Proposed Action would influence 25 percent of the area that has not been previously influenced by development or RFFAs. The cumulative impacts on scenery are similar for Alternative 3B: Lost Creek to Lost Cabin and Alternative 3C: Lost Creek to Highway 20/26 with 37 percent of this unit not been influenced by past or present actions, RFFAs, or the Project associated with these alternative routes. Either Alternative 3B: Lost Creek to Lost Cabin or 3C: Lost Creek to Highway 20/26 will influence 12 percent of the area that has not been previously influenced by development or RFFAs in the SQRU.

Granite Mountains

The area just north of Jeffrey City is known as the Granite Mountains SQRU. This landscape has been influenced by existing cultural modification and scattered oil and gas, as well as pipeline rights-of-way. Sixty-nine percent of this unit has not been influenced by past or present actions, RFFAs, or the Project (all alternative routes). Each alternative would influence 9 percent of the area that has not been previously influenced by development or RFFAs due to its colocation with existing rights-of-way.

Rattlesnake Hills

The Rattlesnake Hills SQRU has been influenced by existing cultural modification and development. Sixty-nine percent of this unit has not been influenced by past or present actions, RFFAs, or the Project (Alternative 3A: Proposed Action). Alternative 3A: Proposed Action would influence 9 percent of the area that has not been previously influenced by development or RFFAs.

4.4.20.2.2 Viewing Locations

Views from identified viewing locations would have a range of cumulative effects resulting from the addition of the Project in context with past and present actions and RFFAs.

4.4.20.2.2.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

As previously mentioned, Segment 1 of the Project has been influenced by industrial development and will continue to be modified in character.

P-2 Green River Recreational Corridor

Views from the Green River while recreating has already been modified. Due to the limited extent of existing development in this area (i.e., river access roads, county roads, scattered residences, and minor transmission lines), this area has been modified minimally by development. Although these cultural modifications have already altered the views from this location, the additive effects from the Proposed Action will increase the development in this area. Due to mitigation, the Project would be bored under the river, thus distancing the change in vegetation color and texture away from the viewing location.

4.4.20.2.2.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

RS-1 Red Desert Backcountry Byway (Simulation)

Views from Red Desert Backcountry Byway have been minimally modified due to existing BLM roads and way-finding signage. Although existing transmission lines and scattered oil and gas developments are present from past and present actions, none are visible from this viewing location. RFFAs will not be visible from this viewing location. The Proposed Action would be the only visual impact resulting from past and present actions and RFFAs. Views along this scenic drive would begin to attract attention based on geometric linear shape created by the Project right-of-way, which would result in moderate change in vegetation form, line, and color, as well as the landform line and color.

RS-2 Highway 191 North

Views from this pullout location have been minimally modified with existing minor pipelines and fencing along the U.S. highway. Through the introduction of the Project on Alternative 2A: Proposed Action, an increase in industrialization of the area would result in from the geometric form created by vegetation clearing and earthwork in the right-of-way. Mitigation would reduce the potential visual impacts, thus reducing the change in views from this viewing location.

RS-2 Highway 191 South

Views from this viewing location have been modified by a pipeline paralleling the road. The introduction of Alternative 2B: Southern Route would result in a geometric form, created by vegetation clearing and earthwork in the right-of-way, perpendicular to views from U.S. Highway 191. The right-of-way would increase the development in this area. Any other RFFA will not be visible from this viewing location.

4.4.20.2.2.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

C1 U.S. Highway 20

Motorists on U.S. Highway 20 have extended views of development from past and present actions, such as transmission lines and several pipelines. The introduction of Alternative 3B: Lost Creek to Lost Cabin would result in a geometric form, created by vegetation clearing and earthwork in the right-of-way,

perpendicular to U.S. Highway 20. The colocation of the Project with past and present actions and RFFAs would not result in significant additive visual impacts from the Project. Similarly, the introduction of Alternative 3C: Lost Creek to Highway 20/26 would result in a geometric form parallel to U.S. Highway 20. The colocation of the Alternative 3C: Lost Creek to Highway 20/26 with past and present actions would not result in significant additive visual impacts from the Project due to the heavy development in the area that already dominates the views from this viewing location.

4.4.21 Water Resources

4.4.21.1 Issues Identified

Cumulative impacts on water resources include impacts on water resources from construction, including increased erosion during and after construction until vegetation is re-established. An increased discharge of sediment into waterways may occur. These impacts would be intensified where other existing actions have already affected the water resources or where another RFFA is proposed in the same area.

4.4.21.2 Existing Conditions

The affected environment describes the baseline conditions for water resources (refer to Chapter 3, Section 3.2.20).

4.4.21.3 Results

The types of effects on water resources would be the same as those described in Section 4.3.20.2. The cumulative effects analysis for water resources considers past and present actions and RFFAs in conjunction with direct and indirect impacts from the Project. The geographic and temporal scopes for the analysis are presented in Table 4-150.

For this analysis, water resources were categorized as surface water resources (perennial waters, such as streams, lakes, ponds, or reservoirs) to most appropriately assess potential cumulative impacts on water resources relative to issues identified for analysis. Surface water quality is an important feature of watershed health that, when maintained, provides long-term, effects on the environment. Results of the analysis of cumulative effects on surface and other water resources are summarized in Table 4-184 through Table 4-186.

The geographic scope for all water resources analyzed includes projects within a 1-mile buffer of the Project, identified below:

- Rands Butte Gas Development Project
- Jonah Infill Drilling Project
- Luman Rim Natural Gas Development Project
- BTA Oil Producers Bravo Field Development
- Eden Ranch Exploratory Oil and Gas Lease
- Fontenelle Natural Gas Infill Drilling Project
- Luman Rim Natural Gas Development Project
- Nitchie Gulch Field
- Riley Ridge Unit Development Project
- Texaco's Stagecoach Draw Unit
- Existing pipelines, transmission lines, roads, and railroads
- RFFAs
- Bird Canyon Field Infill Project
- Normally Pressured Lance Natural Gas Development
- Sheep Mountain Uranium Project
- Moneta Divide Natural Gas and Oil Development

Although mapped ephemeral waters were not identified in the USGS' National Hydrography Dataset, numerous unmapped ephemeral waters exist along the pipeline route. Due to the potentially large number of ephemeral stream crossings, the actual number of waters crossed by the pipeline will be provided as an appendix after the Preferred Alternative is selected.

Table 4-184
Cumulative Effects Summary for Impaired Water

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	0	0	0	0	0.0
1A Variation: Dry Basin Draw	0	0	0	0	0.0
1B: Dry Piney	0	0	0	0	0.0
1C: Figure Four	0	0	0	0	0.0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	0	0	0	0	0.0
2B: Southern Route	164	2	5	160	1.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	0	0	0	0	0.0
3B: Lost Creek to Lost Cabin	0	0	0	0	0.0
3C: Lost Creek to Highway 20/26	0	0	0	0	0.0

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-185
Cumulative Effects Summary for Intermittent Streams

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	640	3	62	578	<1
1A Variation: Dry Basin Draw	729	4	100	629	<1
1B: Dry Piney	804	3	232	572	<1
1C: Figure Four	951	3	371	581	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	2,132	15	317	1,815	<1
2B: Southern Route	2,150	14	377	1,773	<1

Table 4-185 Cumulative Effects Summary for Intermittent Streams					
Alternative Route	**Total Available Resource (acres)**	**Incremental Project Development (acres)**	**Estimated Cumulative Development (acres)**	**Remaining Resource (acres)**	**Percentage of Project Impacts**
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	1,608	7	310	1,298	<1
3B: Lost Creek to Lost Cabin	1,294	3	331	963	<1
3C: Lost Creek to Highway 20/26	1,709	2	584	1,126	<1
NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.					

Table 4-186 Cumulative Effects Summary for Perennial Streams					
Alternative Route	**Total Available Resource (acres)**	**Incremental Project Development (acres)**	**Estimated Cumulative Development (acres)**	**Remaining Resource (acres)**	**Percentage of Project Impacts**
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	77	1	5	72	<1
1A Variation: Dry Basin Draw	77	1	5	72	<1
1B: Dry Piney	127	1	24	102	<1
1C: Figure Four	96	0	48	49	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	455	3	92	363	<1
2B: Southern Route	382	3	89	293	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	171	1	22	148	<1
3B: Lost Creek to Lost Cabin	39	0	5	33	<1
3C: Lost Creek to Highway 20/26	39	0	5	33	<1
NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.					

Overall, the percentage of the incremental Project contribution to cumulative effects on surface water resources would be equal to or less than 1 percent, regardless of the alternative route selected. Cumulative effects on impaired waters would be anticipated on Alternative 2B: Southern Route in Segment 2; however, only 5 acres near impaired waters would be disturbed out of a total of 164 acres in the CIAA. No cumulative effects on impaired waters would be anticipated along Alternative 2A: Proposed Action. Cumulative development near intermittent and ephemeral streams would affect the most acres in Segment 2 of the CIAA but varies little by alternative route.

In all three segments of the Project area, fewer cumulative effects on palustrine emergent wetlands would be anticipated along the Proposed Action route than along the alternative routes considered. In Segment 1, cumulative impacts on 51 acres of palustrine scrub-shrub wetlands (of 88 total acres) could be associated

with Alternative 1C: Figure Four. There would be fewer cumulative effects associated with the Proposed Action and the other routes considered in the segment.

Implementation of design features of the Proposed Action for environmental protection, including monitoring of stream and river crossings during construction, and agency-required mitigation measures, including avoidance, if possible, and reclamation of disturbed areas, would minimize impacts of the Proposed Action on water resources. It can be assumed that similar measures would be required for other RFFAs located on federally administered lands.

4.4.22 Wetlands and Riparian Areas

4.4.22.1 Issues Identified

Cumulative impacts on wetlands and riparian areas include modification of upland, riparian, and wetland vegetation. These impacts would be intensified where other existing actions have already affected the wetlands or riparian areas or where another RFFA is proposed in the same area.

4.4.22.2 Existing Conditions

The affected environment describes the baseline conditions for wetland and riparian areas (refer to Chapter 3, Section 3.2.21).

4.4.22.3 Results

The types of effects on wetlands and riparian areas would be the same as those described in Section 4.3.21.2. This cumulative analysis relies on the analysis of direct and indirect impacts from the Project and considers them in conjunction with the past and present actions and RFFAs listed in Table 4-151 and Table 4-152. Table 4-187 through Table 4-189 summarize the cumulative effects of the Project on wetland resources and riparian habitat.

Table 4-187
Cumulative Effects Summary for Palustrine Emergent Wetlands

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	20	0	1	19	<1
1A Variation: Dry Basin Draw	20	0	1	19	<1
1B: Dry Piney	20	0	1	19	<1
1C: Figure Four	88	0	51	37	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	18	0	7	11	<1
2B: Southern Route	58	0	8	50	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	209	1	28	181	<1
3B: Lost Creek to Lost Cabin	241	1	45	196	<1
3C: Lost Creek to Highway 20/26	241	1	45	196	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-188
Cumulative Effects Summary for Palustrine Scrub-Shrub Wetlands

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	61	0	3	58	<1
1A Variation: Dry Basin Draw	61	0	3	58	<1
1B: Dry Piney	61	0	3	58	<1
1C: Figure Four	14	0	2	11	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	22	0	1	21	<1
2B: Southern Route	0	0	0	0	0.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	21	0	4	17	<1
3B: Lost Creek to Lost Cabin	21	0	4	17	<1
3C: Lost Creek to Highway 20/26	21	0	4	17	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-189
Cumulative Effects Summary for Riparian Habitat

Alternative	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	25	0	0	25	<1
1A Variation: Dry Basin Draw	25	0	0	25	<1
1B: Dry Piney	25	0	0	25	<1
1C: Figure Four	26	0	8	18	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	61	1	7	54	1.0
2B: Southern Route	38	0	6	32	1.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	20	0	1	19	<1
3B: Lost Creek to Lost Cabin	41	0	8	33	<1
3C: Lost Creek to Highway 20/26	20	0	1	19	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Overall, the percentage of the incremental Project contribution to cumulative effects on wetlands and riparian areas would be equal to or less than 1 percent, regardless of the alternative route selected.

In all three segments of the Project area, fewer cumulative effects on palustrine emergent wetlands would be anticipated along the Proposed Action route than along the alternative routes considered. In Segment 1, cumulative impacts on 51 acres of palustrine scrub-shrub wetlands (of 88 total acres) could be associated with Alternative 1C: Figure Four. There would be fewer cumulative effects on palustrine scrub-shrub wetlands associated with Alternative 1A: Proposed Action and the other routes considered in the segment.

Cumulative effects on riparian areas would be greatest in Segment 2 of the Project area; Alternative 2B: Southern Route would have fewer cumulative effects on riparian area than Alternative 2A: Proposed Action in this segment. In other Project segments, the cumulative effect on riparian areas varies little by alternative route.

Implementation of design features of the Proposed Action for environmental protection, including monitoring of wetlands and riparian areas during construction, and agency-required mitigation measures, including avoidance, if possible, and intense reclamation of disturbed wetlands or riparian areas, would minimize impacts of the Proposed Action on water resources. It can be assumed that similar measures would be required for other RFFAs located on federally administered lands.

4.4.23 Wild Horses and Burros

4.4.23.1 Issues Identified

Cumulative impacts on wild horses and burros include interference with wild horse management, wild horse displacement, potential spread of noxious and invasive weeds, increased mortality of wild horses from increased traffic, and impacts on active foaling areas. These impacts would be intensified where other existing actions have already affected wild horse and burro habitat or where an RFFA is proposed in the same area.

4.4.23.2 Existing Conditions

The affected environment describes the baseline conditions for wild horses and burros (refer to Chapter 3, Section 3.2.22).

4.4.23.3 Results

Past and present actions and RFFAs within the geographic scope include:

Past and Present Projects

- Rands Butte Gas Development Project
- Luman Rim Natural Gas Development Project
- BTA Oil Producers Bravo Field Development
- Fontenelle Natural Gas Infill Drilling Project
- Hay Reservoir Unit Natural Gas Infill Development
- Jonah Infill Drilling Project
- Kennecott-Sweetwater Uranium Recovery Facility
- Lost Creek Uranium ISR Project
- Nitchie Gulch Field
- Pinedale Anticline Project
- Texaco's Stagecoach Draw Unit
- Ten Mile Rim Coal Lease-by-Application Project

Reasonably Foreseeable Future Actions

- Bird Canyon Field Infill Project
- Continental Divide-Creston Natural Gas Project
- Lost Creek Uranium Proposed ISR Project
- Monell-Arch Oil and Gas Development
- Normally Pressured Lance Natural Gas Development Project
- Sheep Mountain Uranium Project

The cumulative effects summary for wild horse management areas is presented in Table 4-190.

Table 4-190
Cumulative Effects Summary for Wild Horse Management Areas

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	626,521	5	24,182	602,339	<1
1A Variation: Dry Basin Draw	626,521	5	24,182	602,340	<1
1B: Dry Piney	626,521	5	24,181	602,340	<1
1C: Figure Four	626,521	6	24,182	602,339	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	1,862,396	47	60,105	1,802,291	<1
2B: Southern Route	2,199,892	61	70,076	2,129,816	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	1,862,396	47	60,105	1,802,291	<1
3B: Lost Creek to Lost Cabin	2,199,892	61	70,076	2,129,816	<1
3C: Lost Creek to Highway 20/26	21	0	4	17	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

4.4.23.3.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

The types of effects on wild horse and burros would be the same as those described in Section 4.3.22.2. The percentage of the Project alternative routes located in HMAs for all alternative routes in Segment 1 would be less than 1 percent. Various past and present actions and RFFAs would occur throughout the HMAs in Segment 1. The short-term cumulative effects of the Project, in addition to the past and present actions and RFFAs, would include construction activities of projects that would require gates being added to existing fences; construction-related disturbances (noise, vehicles/equipment, personnel) associated with development of access roads, site grading, and building structures; and larger footprints of disturbance before restoration activities occur. Long-term cumulative effects would include reduced habitat and rangeland available where permanent disturbance (e.g., structures footprint) would occur from the projects. Refer to Table 4-190 for detailed information.

4.4.23.3.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

The types of effects on wild horse and burros would be the same as those described in Section 4.3.22.2. The percentage of the Project alternative routes located in grazing allotments for both alternative routes in Segment 2 would be less than 1 percent. Various past and present actions and RFFAs would occur throughout the grazing allotments in Segment 2. Cumulative effects in Segment 2 from past and present actions and RFFAs would be similar to the effects described for Segment 1. Refer to Table 4-190 for detailed information.

4.4.23.3.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

The types of effects on wild horse and burros would be the same as those described in Section 4.3.22.2. The percentage of the Project alternative routes located in grazing allotments for all alternative routes in Segment 3 would be less than 1 percent. Various past and present actions and RFFAs would occur throughout the HMAs in Segment 3. Cumulative effects in Segment 3 from past and present actions and RFFAs would be similar to the effects described for Segment 1. Refer to Table 4-190 for detailed information.

4.4.24 Wildlife

4.4.24.1 Issues Identified

Cumulative impacts on wildlife include the types of potential effects on wildlife habitat and/or populations discussed in Section 4.3.2.3.

4.4.24.2 Existing Conditions

The affected environment describes the baseline conditions for wildlife resources (refer to Section 3.2.23).

4.4.24.3 Results

Past and present actions and other RFFAs occurring within the CIAA for wildlife include:

Past and Present Projects

- Fontenelle Natural Gas Infill Drilling Project
- Jonah Infill Drilling Project
- Eden Ranch Exploratory Oil and Gas Lease
- Hay Reservoir Unit Natural Gas Infill Development Project
- HS Resources, Inc., Natural Gas Exploration Project
- Luman Rim Natural Gas Development Project
- North Nitchie Gulch
- Riley Ridge Unit Development Project
- Ten Mile Rim Coal Lease-by-Application Project
- Rands Butte Gas Development Project
- BTA Oil Producers Bravo Field Development
- Texaco's Stagecoach Draw Unit
- Pinedale Anticline Project

Reasonably Foreseeable Future Actions

- Bird Canyon Field Infill Project EIS
- Dry Piney Deep Project
- Normally Pressured Lance Natural Gas Development Project EIS
- Continental Divide-Creston Natural Gas Project EIS
- Sheep Mountain Uranium Project EIS
- Moneta Divide Natural Gas and Oil Development Project EIS (formerly GMI)

4.4.24.3.1 Big Game

The types of effects on big game would be the same as those described in Section 4.3.23.2. A summary of results of the cumulative effects analysis for big game habitat are presented in this section as follows:

- Herd Management Units
- Elk Crucial Winter/Yearlong Range (Table 4-191)
- Elk Parturition Areas (Table 4-192)
- Antelope Crucial Winter/Yearlong Range (Table 4-193)
- Antelope Migration Routes (Table 4-194)
- Mule Deer Crucial/Winter Range (Table 4-195)
- Mule Deer Crucial Winter/Yearlong Range (Table 4-196)
- Mule Deer Severe Winter Range (Table 4-197)
- Mule Deer Migration Routes (Table 4-198)
- Mule Deer Parturition Areas (Table 4-199)
- Moose Crucial Winter/Yearlong Range (Table 4-200)

4.4.24.3.1.1 Qualitative Analysis of Herd Management Units

Table 3-175 presents the Herd Management Units crossed by each alternative route. The Project contribution to cumulative effects on herd management units for all alternative routes would be expected to be relatively low due to implementation of design features, including wildlife disturbance and harassment minimization (Design Feature 2) and vehicle speed limitations (Design Feature 3), and agency-required mitigation measures, including sensitive resource avoidance (Agency-Required Mitigation Measure 1), seasonal restrictions (Agency-Required Mitigation Measure 7), and limits on sensitive habitat accessibility (Agency-Required Mitigation Measure 10). Impacts on herd management units would also be minimized by the siting of the alternative routes within existing disturbance to the extent possible. Various past and present actions and RFFAs would occur throughout the Herd Management Units in Segment 1. The short-term cumulative effects of the Project, in addition to the past and present actions and RFFAs, would include construction activities of projects that would result in temporary habitat disturbance; construction-related disturbances (noise, vehicles/equipment, and personnel) associated with development of access roads, site grading, and building structures; and larger footprints of disturbance before restoration activities occur. The long-term cumulative effects would be habitat loss where permanent disturbance/structures footprints would occur from the projects.

4.4.24.3.1.2 Quantitative Analysis of Seasonal Ranges

The estimated area of cumulative development in elk habitats is summarized in Table 4-191 and Table 4-192.

Table 4-191
Cumulative Effects Summary for Elk Crucial Winter Yearlong Range

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	35,394	2	919	34,475	<1
1A Variation: Dry Basin Draw	35,394	2	919	34,475	<1
1B: Dry Piney	35,394	2	918	34,475	<1
1C: Figure Four	42,866	2	1,515	41,351	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	68,164	12	432	67,732	<1
2B: Southern Route	69,134	7	629	68,505	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	4,297	0	37	4,259	<1
3B: Lost Creek to Lost Cabin	4,297	0	37	4,259	<1
3C: Lost Creek to Highway 20/26	4,297	0	37	4,259	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-192
Cumulative Effects Summary for Elk Parturition Areas

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	8,028	0	199	7,829	<1
1A Variation: Dry Basin Draw	8,028	0	199	7,829	<1
1B: Dry Piney	8,028	0	199	7,829	<1
1C: Figure Four	8,117	0	204	7,913	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	21,331	1	182	21,149	<1
2B: Southern Route	14,982	0	61	14,922	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	299	0	4	295	<1
3B: Lost Creek to Lost Cabin	299	0	4	295	<1
3C: Lost Creek to Highway 20/26	299	0	4	295	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

The Project contribution to cumulative effects on elk habitats for all alternative routes in Segment 1 would be less than 1 percent. In Segment 1, greater cumulative effects would be associated with Alternative 1C: Figure Four compared with the other three alternative routes, which would have the same or relatively similar cumulative effects. In Segment 2, cumulative effects on crucial winter yearlong habitat would be higher with Alternative 2B: Southern Route relative to Alternative 2A: Proposed Action, whereas Alternative 2A: Proposed Action would have higher cumulative effects on parturition habitat. Cumulative effects on elk habitat would be the same for the three alternative routes in Segment 3.

Implementation of design features, including wildlife disturbance and harassment minimization (Design Feature 2) and vehicle speed limitations (Design Feature 3), and agency-required mitigation measures, including seasonal restrictions (Agency-Required Mitigation Measure 7) and limits on sensitive habitat accessibility (Agency-Required Mitigation Measure 10), would minimize impacts on elk habitat. It can be assumed that similar measures would be required for other RFFAs located on federally administered lands. The Project contribution to cumulative impacts would also be minimized from the siting of the alternative routes within existing disturbance to the extent possible.

The estimated area of cumulative development in antelope habitats is summarized in Table 4-193 and Table 4-194.

Table 4-193
Cumulative Effects Summary for Antelope Crucial Winter/Yearlong Range

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	45,366	8	2,937	42,429	<1
1A Variation: Dry Basin Draw	45,279	8	2,936	42,342	<1
1B: Dry Piney	41,936	2	2,889	39,047	<1
1C: Figure Four	37,707	3	5,770	31,937	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	138,089	27	4,682	133,407	<1
2B: Southern Route	213,449	38	5,252	208,197	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	104,573	9	2,488	102,085	<1
3B: Lost Creek to Lost Cabin	97,806	4	4,173	93,633	<1
3C: Lost Creek to Highway 20/26	112,598	4	4,930	107,669	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-194
Cumulative Effects Summary for Antelope Migration Routes

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	8,433	1	415	8,018	<1
1A Variation: Dry Basin Draw	8,433	1	415	8,018	<1
1B: Dry Piney	9,938	1	435	9,503	<1
1C: Figure Four	11,609	1	1,684	9,924	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	29,865	4	857	29,009	<1
2B: Southern Route	22,588	2	842	21,746	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	3,917	1	511	3,406	<1
3B: Lost Creek to Lost Cabin	2,922	1	502	2,420	<1
3C: Lost Creek to Highway 20/26	3,328	1	510	2,818	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

The Project contribution to cumulative effects on antelope habitats for all alternative routes in Segment 1 would be less than 1 percent. In Segment 1, greater cumulative effects would be associated with Alternative 1C: Figure Four compared with the other three alternative routes, which would have relatively similar cumulative effects. In Segment 2, cumulative effects on crucial winter yearlong habitat would be higher with Alternative 2B: Southern Route relative to Alternative 1A: Proposed Action, whereas the cumulative effects with the two alternative routes would be relatively similar for migration routes. In Segment 3, cumulative effects associated with the alternative routes would be relatively similar for antelope migration routes, whereas cumulative effects would be highest with Alternative 3C: Lost Creek to Highway 20/26 and lowest with Alternative 3A: Proposed Action for crucial winter yearlong habitat.

Implementation of design features, including wildlife disturbance and harassment minimization (Design Feature 2) and vehicle speed limitations (Design Feature 3), and agency-required mitigation measures, including seasonal restrictions (Agency-Required Mitigation Measure 7) and limits on sensitive habitat accessibility (Agency-Required Mitigation Measure 10), would minimize impacts on antelope habitat. It can be assumed that similar measures would be required for other RFFAs located on federally administered lands. The Project contribution to cumulative impacts would also be minimized from the siting of the alternative routes within existing disturbance to the extent possible.

The estimated area of cumulative development in mule deer habitats is summarized in Table 4-195 through Table 4-199.

Table 4-195
Cumulative Effects Summary for Mule Deer Crucial Winter Range

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	86,144	15	8,217	77,927	<1
1A Variation: Dry Basin Draw	86,954	15	8,372	78,582	<1
1B: Dry Piney	103,724	13	13,338	90,387	<1
1C: Figure Four	111,574	11	19,445	92,128	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	33,634	5	370	33,264	<1
2B: Southern Route	5,693	0	118	5,575	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	0	0	0	0	0.0
3B: Lost Creek to Lost Cabin	0	0	0	0	0.0
3C: Lost Creek to Highway 20/26	0	0	0	0	0.0

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-196
Cumulative Effects Summary for Mule Deer Crucial Winter/Yearlong Range

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	2,740	0	84	2,655	<1
1A Variation: Dry Basin Draw	2,740	0	84	2,655	<1
1B: Dry Piney	2,740	0	84	2,655	<1
1C: Figure Four	2,740	0	84	2,655	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	196	0	5	191	<1
2B: Southern Route	32,243	5	427	31,816	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	67,821	7	1,219	66,603	<1
3B: Lost Creek to Lost Cabin	36,852	2	1,831	35,022	<1
3C: Lost Creek to Highway 20/26	30,731	2	1,021	29,710	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-197
Cumulative Effects Summary for Mule Deer Severe Winter Range

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	0	0	0	0	0
1A Variation: Dry Basin Draw	0	0	0	0	0
1B: Dry Piney	0	0	0	0	0
1C: Figure Four	0	0	0	0	0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	23,837	5	126	23,711	<1
2B: Southern Route	7,874	0	72	7,802	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	0	0	0	0	0
3B: Lost Creek to Lost Cabin	0	0	0	0	0
3C: Lost Creek to Highway 20/26	0	0	0	0	0

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-198
Cumulative Effects Summary for Mule Deer Migration Routes

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	7,770	0	1,499	6,272	<1
1A Variation: Dry Basin Draw	8,207	1	1,506	6,702	<1
1B: Dry Piney	8,475	1	1,511	6,965	<1
1C: Figure Four	9,295	1	1,192	8,103	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	5,786	0	557	5,229	<1
2B: Southern Route	5,828	1	575	5,253	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	8,621	1	742	7,880	<1
3B: Lost Creek to Lost Cabin	8,621	1	742	7,880	<1
3C: Lost Creek to Highway 20/26	8,621	1	742	7,880	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-199
Cumulative Effects Summary for Mule Deer Parturition Areas

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	0	0	0	0	0
1A Variation: Dry Basin Draw	0	0	0	0	0
1B: Dry Piney	0	0	0	0	0
1C: Figure Four	0	0	0	0	0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	5,437	1	31	5,406	<1
2B: Southern Route	11,066	0	31	11,034	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	0	0	0	0	0.0
3B: Lost Creek to Lost Cabin	0	0	0	0	0.0
3C: Lost Creek to Highway 20/26	0	0	0	0	0.0

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

The Project contribution to cumulative effects on mule deer habitat for all alternative routes in Segments 1, 2, and 3 would be less than 1 percent. In Segment 1, cumulative effects would not be anticipated for mule deer severe winter range or parturition range for any of the alternative routes. Cumulative effects on crucial winter habitat would be highest for Alternative 1C: Figure Four, followed by Alternatives 1B: Dry Piney and 1A Variation: Dry Basin Draw, and the lowest cumulative effects would be with Alternative 1A: Proposed Action. For crucial winter yearlong habitat, cumulative impacts would be the same for all alternative routes. Cumulative effects on migration routes would be highest and relatively similar for Alternative 1A: Proposed Action and Alternatives 1A Variation: Dry Basin Draw and 1B: Dry Piney, and lowest with Alternative 1C: Figure Four.

In Segment 2, cumulative effects with the two alternative routes would be the same for parturition range and relatively similar for migration routes. Cumulative effects would be higher on crucial winter habitat and severe winter range with Alternative 2A: Proposed Action compared to Alternative 2B: Southern Route, whereas cumulative effects associated with Alternative 2B: Southern Route would be greater than those with the Proposed Action for crucial winter yearlong habitat.

In Segment 3, no cumulative effects would be anticipated for crucial winter habitat, severe winter range, or parturition range. Cumulative effects on migration routes would be relatively similar for all three alternative routes. For crucial winter yearlong habitat, cumulative effects would be highest for Alternative 3B: Lost Creek to Lost Cabin and lowest for Alternative 3C: Lost Creek to Highway 20/26.

Implementation of design features, including wildlife disturbance and harassment minimization (Design Feature 2) and vehicle speed limitations (Design Feature 3), and agency-required mitigation measures, including seasonal restrictions (Agency-Required Mitigation Measure 7) and limits on sensitive habitat accessibility (Agency-Required Mitigation Measure 10), would minimize impacts on mule deer habitat. It can be assumed that similar measures would be required for other RFFAs located on federally

administered lands. The Project contribution to cumulative impacts would also be minimized from the siting of the alternative routes within existing disturbance to the extent possible.

The estimated area of cumulative development in moose habitat is summarized in Table 4-200.

Table 4-200
Cumulative Effects Summary for Moose Crucial Winter/Yearlong Range

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	37,120	5	7,918	29,203	<1
1A Variation: Dry Basin Draw	37,120	5	7,918	29,203	<1
1B: Dry Piney	38,388	5	7,937	30,451	<1
1C: Figure Four	41,794	4	7,752	34,042	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	0	0	0	0	0.0
2B: Southern Route	0	0	0	0	0.0
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	5,817	1	113	5,704	<1
3B: Lost Creek to Lost Cabin	5,817	1	113	5,704	<1
3C: Lost Creek to Highway 20/26	5,817	1	113	5,704	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

The Project contribution to cumulative effects on moose habitat for all alternative routes in Segment 1 would be less than 1 percent. In Segment 1, the lowest cumulative effects would be associated with Alternative 1C: Figure Four, while the other three alternative routes would have relatively similar cumulative effects on moose habitat. In Segment 2, no cumulative effects are anticipated on moose habitat for either alternative route. Cumulative effects on moose habitat would be relatively similar for the three alternative routes in Segment 3.

Implementation of design features, including wildlife disturbance and harassment minimization (Design Feature 2) and vehicle speed limitations (Design Feature 3), and agency-required mitigation measures, including sensitive resource avoidance (Agency-Required Mitigation Measure 1), seasonal restrictions (Agency-Required Mitigation Measure 7), and limits on sensitive habitat accessibility (Agency-Required Mitigation Measure 10), would minimize impacts on moose habitat. It can be assumed that similar measures would be required for other RFFAs located on federally administered lands. The Project contribution to cumulative impacts would also be minimized from the siting of the alternative routes within existing disturbance to the extent possible.

4.4.24.3.2 Migratory Birds

The types of effects on migratory birds would be the same as those described in Section 4.3.22.2. Cumulative effects on non-raptorial migratory birds, including BLM sensitive migratory bird species, are discussed collectively in this section as cumulative effects are similar for all migratory bird species. BLM

sensitive migratory bird species addressed in this section include Brewer's sparrow, loggerhead shrike, long-billed curlew, mountain plover, sage sparrow, and sage thrasher.

Cumulative effects on migratory birds, including BLM sensitive migratory bird species, are expected, as all alternative routes in each segment cross migratory bird habitat.

Cumulative effects on migratory birds, including BLM sensitive migratory bird species could include habitat loss, displacement, and fragmentation. However, the Project contribution to cumulative effects is expected to be relatively low due to implementation of design features, such as preconstruction surveys for sensitive species (Design Feature 1), and agency-required mitigation measures, including seasonal restrictions (Agency-Required Mitigation Measure 7). It can be assumed that similar measures would be required for other RFFAs located on federally administered lands. The Project contribution to cumulative impacts would also be minimized from the siting of the alternative routes within existing disturbance to the extent possible.

4.4.24.3.3 Raptors

Cumulative effects on raptor species, including BLM sensitive raptor species, are discussed collectively in this section as cumulative effects are similar for all raptor species. The types of effects on raptors would be the same as those described in Section 4.3.22.2. BLM sensitive raptor species addressed in this section include bald eagle, golden eagle, burrowing owl, ferruginous hawk, merlin, northern goshawk, osprey, and peregrine falcon.

The estimated area of cumulative development in bald eagle habitat is summarized in Table 4-201 and Table 4-202.

Table 4-201
Cumulative Effects Summary for Bald Eagle Summer Breeding Habitat

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	73,857	7	12,196	61,660	<1
1A Variation: Dry Basin Draw	74,865	7	12,248	62,617	<1
1B: Dry Piney	80,864	7	13,485	67,379	<1
1C: Figure Four	89,889	5	12,837	77,053	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	10,039	1	430	9,610	<1
2B: Southern Route	29,248	1	483	28,765	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	11,549	2	393	11,156	<1
3B: Lost Creek to Lost Cabin	16,212	0	1,701	14,511	<1
3C: Lost Creek to Highway 20/26	16,534	0	1,240	15,295	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-202 Cumulative Effects Summary for Bald Eagle Winter Habitat					
Alternative Route	**Total Available Resource (acres)**	**Incremental Project Development (acres)**	**Estimated Cumulative Development (acres)**	**Remaining Resource (acres)**	**Percentage of Project Impacts**
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	34,452	1	12,156	22,296	<1
1A Variation: Dry Basin Draw	34,450	1	12,156	22,294	<1
1B: Dry Piney	34,847	3	12,247	22,600	<1
1C: Figure Four	34,567	1	10,634	23,933	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	3,283	0	707	2,576	<1
2B: Southern Route	1,444	0	868	576	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	41,270	4	2,438	38,832	<1
3B: Lost Creek to Lost Cabin	33,703	3	2,845	30,857	<1
3C: Lost Creek to Highway 20/26	48,112	3	4,632	43,480	<1
NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.					

The estimated area of cumulative development in golden eagle habitat is summarized in Table 4-203.

Table 4-203 Cumulative Effects Summary for Golden Eagle Breeding Habitat					
Alternative Route	**Total Available Resource (acres)**	**Incremental Project Development (acres)**	**Estimated Cumulative Development (acres)**	**Remaining Resource (acres)**	**Percentage of Project Impacts**
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	175,283	20	17,836	157,446	<1
1A Variation: Dry Basin Draw	176,378	19	17,999	158,379	<1
1B: Dry Piney	195,060	18	23,689	171,371	<1
1C: Figure Four	213,649	15	30,062	183,587	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	673,441	94	22,728	650,712	<1
2B: Southern Route	721,100	91	18,164	702,936	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	446,513	37	11,370	435,143	<1
3B: Lost Creek to Lost Cabin	394,556	23	16,413	378,142	<1
3C: Lost Creek to Highway 20/26	536,430	18	20,478	515,952	<1
NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.					

The Project contribution to cumulative effects on bald eagle habitat for all alternative routes in Segments 1, 2, and 3 would be less than 1 percent. In Segment 1, cumulative effects on bald eagle summer breeding habitat would be highest with Alternative 1B: Dry Piney, followed by Alternatives 1C: Figure Four and 1A Variation: Dry Basin Draw, and lowest with Alternative 1A: Proposed Action. For winter habitat, cumulative effects would be highest with Alternative 1B: Dry Piney, the same for Alternative 1A: Proposed Action and Alternative 1A Variation: Dry Basin Draw, and lowest with Alternative 1C: Figure Four. In Segment 2, cumulative effects associated with Alternative 2B: Southern Route would be higher than those with Alternative 2A: Proposed Action on both summer breeding habitat and winter habitat. In Segment 3, for summer breeding habitat, cumulative effects would be greatest with Alternative 3B: Lost Creek to Lost Cabin and lowest with Alternative 3A: Proposed Action. Cumulative effects on winter habitat would be highest with Alternative 3C: Lost Creek to Highway 20/26 and lowest with Alternative 3A: Proposed Action.

The Project contribution to cumulative effects on golden eagle habitat for all alternative routes in Segments 1, 2, and 3 would be less than 1 percent. For Segment 1, cumulative effects would be highest with Alternative 1C: Figure Four, followed by Alternatives 1B: Dry Piney and 1A Variation: Dry Basin Draw, and lowest with Alternative 1A: Proposed Action. In Segment 2, cumulative effects would be higher for Alternative 2A: Proposed Action than for Alternative 2B: Southern Route. In Segment 3, cumulative effects would be greatest for Alternative 3C: Lost Creek to Highway 20/26 and lowest for Alternative 3A: Proposed Action.

Cumulative effects on all raptors species, including BLM sensitive raptor species could include habitat loss, displacement, and fragmentation. However, the Project contribution to cumulative effects is expected to be relatively low due to implementation of design features, such as preconstruction surveys for sensitive species (Design Feature 1), and agency-required mitigation measures, including seasonal restrictions (Agency-Required Mitigation Measure 7). It can be assumed that similar measures would be required for other RFFAs located on federally administered lands. The Project contribution to cumulative impacts would also be minimized from the siting of the alternative routes within existing disturbance to the extent possible.

4.4.24.3.4 Greater Sage-Grouse

The estimated area of cumulative development in greater sage-grouse PHMA, GHMA, and SFA is summarized in Table 4-204, Table 4-205, and Table 4-206 respectively, and described below by segment. The types of effects on greater sage-grouses would be the same as those described in Section 4.3.23.5.5.1.

4.4.24.3.4.1 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

Alternative routes in Segment 1 do not cross PHMA or SFA; therefore, there would be no incremental Project contribution to cumulative effects on greater sage-grouse PHMA or SFA in Segment 1. All alternative routes in Segment 1 cross GHMA; therefore, implementation of any of the alternative routes in Segment 1 would contribute incrementally to modification of GHMA in the CIAA. However, the percentage of the incremental Project contribution to cumulative effects on greater sage-grouse GHMA for all alternative routes in Segment 1 would be less than 1 percent. In accordance with the Wyoming ARMPA, implementation of agency-required mitigation measures (refer to Table 2-17), including seasonal and noise restrictions, avoidance of GHMA within 0.25 mile of occupied leks, and reclamation to restore disturbed GHMA to preconstruction conditions, would minimize impacts on GHMA. The Project contribution to cumulative impacts would also be minimized from the siting of the alternative routes within existing disturbance to the extent possible.

Table 4-204
Cumulative Effects Summary for Greater Sage-Grouse Priority Habitat Management Area Based on the Density Disturbance Calculation Tool

Alternative Route	Existing Condition of PHMA Assessment Area			Estimated Project-Related Disturbance		Cumulative Disturbance		
	PHMA Assessment Area (acres)1	Undisturbed Area within PHMA Assessment Area (acres)2	Area with Existing Disturbance within PHMA Assessment Area (acres)3	Distance Project Crosses Undisturbed Area within PHMA (miles)[4]	Estimated Project Disturbance within Undisturbed Area of PHMA (acres)5	Cumulative Development/Disturbance within PHMA Assessment Area (acres)6	Remaining Resource Inventory (acres)7	Percentage of Cumulative Disturbance within PHMA
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant								
1A: Proposed Action	0	0	0	0	0	0	0	0
1B: Dry Piney	0	0	0	0	0	0	0	0
1C: Figure Four	0	0	0	0	0	0	0	0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect								
2A: Proposed Action	372,359	355,289	16,483	Not available[8]	588	17,071	354,701	4.6
2B: Southern Route	529,501	517,260	12,242	59	373	12,615	516,886	2.4
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect								
3A: Proposed Action	435,839	421,516	14,323	45	286	14,609	421,230	3.4
3B: Lost Creek to Lost Cabin	272,120	266,132	5,988	24	153	6,141	265,979	2.3
3C: Lost Creek to Highway 20/26	423,608	408,505	15,103	31	194	15,297	408,311	3.6

NOTES:

[1]Based on occupied leks within 4 miles of the Project centerline, buffered by 4 miles and clipped to PHMA; also includes PHMA within 4 miles of the Project centerline.

[2]Areas of no existing disturbance within the PHMA Assessment Area.

[3]Areas of existing disturbance within the PHMA Assessment Area.

[4]Miles crossed by the Project within the PHMA Assessment Area where no existing disturbance exists.

[5]Acre conversion based on the permanent right-of-way width and miles the Project crossed of undisturbed area within PHMA; used to calculate cumulative development/disturbance within the PHMA area.

[6]Sum of (1) area of existing disturbance and (2) estimated Project disturbance within PHMA Assessment Area. This is the cumulative disturbance within the PHMA Assessment Area.

[7]Area of remaining habitat within PHMA Assessment Area if Project is built.

[8]Whereas DDCT analyses for other alternative routes were performed by the BLM, the DDCT analysis for Alternative 2A: Proposed Action was performed by WGFD to include updated quantities of existing disturbance within the DDCT assessment area (refer to Appendix C). This particular figure represents an interim calculation to estimate the percentage of cumulative disturbance in PHMA and was not available to the BLM.

Additional appropriate mitigation may be required to achieve a net conservation gain for greater sage-grouse, as required by the Wyoming ARMPA. Refer to Appendix C for additional discussion of additional mitigation requirements.

4.4.24.3.4.2 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

Alternative routes in Segment 2 cross greater sage-grouse PHMA, GHMA, and SFA, therefore, implementation of either of the alternative routes in Segment 2 would contribute incrementally to modification of PHMA, GHMA, and SFA in the CIAA. Estimated project disturbance to PHMA from Alternative 2A: Proposed Action is only slightly greater than Alternative 2B: Southern Route but would result in greater cumulative disturbance based on the DDCT, as a result of greater existing disturbances in the PHMA assessment area (Table 4-204). Using the DDCT process outlined by the Wyoming Geographic Information Science Center, the cumulative disturbance in PHMA for Alternative 2A: Proposed Action would be 4.6 percent, under the 5 percent of the DDCT area allowable under the Wyoming ARMPA (WGFD 2016; refer to Appendix C). The cumulative disturbance in PHMA for Alternative 2B: Southern Route would be 2.4 percent, under the 5 percent of the DDCT area allowable under the Wyoming ARMPA.

Table 4-205
Cumulative Effects Summary for Greater Sage-Grouse General Habitat Management Areas

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	539,554	178	73,285	466,269	<1
1A Variation: Dry Basin Draw	540,294	178	73,324	466,970	<1
1B: Dry Piney	566,498	175	75,454	491,044	<1
1C: Figure Four	626,938	151	81,844	545,094	<1
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	1,990,113	629	72,817	1,917,296	<1
2B: Southern Route	2,123,570	617	78,617	2,044,952	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	1,367,968	364	29,237	1,338,731	<1
3B: Lost Creek to Lost Cabin	1,230,886	227	39,969	1,190,917	<1
3C: Lost Creek to Highway 20/26	1,611,791	179	48,370	1,563,421	<1

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table 4-206
Cumulative Effects Summary for Greater Sage-Grouse Focal Areas

Alternative Route	Total Available Resource (acres)	Incremental Project Development (acres)	Estimated Cumulative Development (acres)	Remaining Resource (acres)	Percentage of Project Impacts
Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant					
1A: Proposed Action	2,690	0	28	2,662	0
1A Variation: Dry Basin Draw	2,690	0	28	2,662	0
1B: Dry Piney	2,690	0	28	2,662	0
1C: Figure Four	2,690	0	28	2,662	0
Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect					
2A: Proposed Action	540,570	30	6,657	533,913	<1
2B: Southern Route	431,804	32	6,330	425,475	<1
Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect					
3A: Proposed Action	14,401	0	457	13,944	0
3B: Lost Creek to Lost Cabin	14,399	0	457	13,943	0
3C: Lost Creek to Highway 20/26	14,399	0	457	13,943	0

NOTE: Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

In GHMA and SFA, the percentage of the incremental Project contribution to cumulative effects for both alternative routes in Segment 2 would be less than 1 percent (Table 4-205 and Table 4-206).

In accordance with the Wyoming ARMPA, implementation of agency-required mitigation measures (refer to Table 4-139), including seasonal and noise restrictions, avoidance of PHMA within 0.6 mile of occupied leks, avoidance of GHMA within 0.25 mile of occupied leks, and reclamation to restore disturbed PHMA, GHMA, and SFA to preconstruction conditions, would minimize impacts on PHMA, GHMA, and SFA. The Project contribution to cumulative impacts would also be minimized from the siting of the alternative routes within existing disturbance to the extent possible.

Additional appropriate mitigation may be required to achieve a net conservation gain for greater sage-grouse, as required by the Wyoming ARMPA. Refer to Appendix C for additional discussion of additional mitigation requirements.

4.4.24.3.4.3 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

Alternative routes in Segment 3 cross greater sage-grouse PHMA and GHMA, therefore, implementation of any of the alternative routes in Segment 3 would contribute incrementally to modification of PHMA and GHMA in the CIAA. Alternative routes in Segment 3 do not cross SFA; therefore, there would be no incremental Project contribution to cumulative effects on greater sage-grouse SFA in Segment 3.

Estimated Project disturbance to PHMA from Alternative 3A: Proposed Action is greater than the other two alternative routes but would result in slightly less cumulative disturbance (3.4 percent) than Alternative 3C: Lost Creek to Highway 20/26 (3.6 percent) based on the DDCT, as a result of less existing disturbance in the PHMA assessment area (Table 4-204). Cumulative disturbance in PHMA

would be the least for Alternative 3B: Lost Creek to Lost Cabin (2.3 percent) but all three alternative routes would not exceed the 5 percent of the DDCT area allowable under the Wyoming ARMPA.

In GHMA, the percentage of the incremental Project contribution to cumulative effects on greater sage-grouse GHMA for all alternative routes in Segment 3 would be less than 1 percent (Table 4-205).

In accordance with the Wyoming ARMPA, implementation of agency-required mitigation measures, including seasonal and noise restrictions, avoidance of PHMA within 0.6 mile of occupied leks, avoidance of GHMA within 0.25 mile of occupied leks, and reclamation to restore disturbed PHMA and GHMA to preconstruction conditions, would minimize impacts on PHMA and GHMA. The Project contribution to cumulative impacts would also be minimized from the siting of the alternative routes within existing disturbance to the extent possible.

Additional appropriate mitigation may be required to achieve a net conservation gain for greater sage-grouse, as required by the Wyoming ARMPA. Refer to Appendix C for additional discussion of additional mitigation requirements.

Cumulative effects on Wyoming pocket gopher habitat are expected with all alternative routes in Segments 2 and 3, as mapped habitat is crossed by all alternative routes; however, no mapped habitat is crossed by any of the Segment 1 alternative routes. Cumulative effects on Wyoming pocket gopher could include habitat loss, displacement, and fragmentation. However, the Project contribution to cumulative effects is expected to be relatively low due to implementation of design features, such as preconstruction surveys for sensitive species (Design Feature 1), and agency-required mitigation measures, including seasonal restrictions (Agency-Required Mitigation Measure 7). It can be assumed that similar measures would be required for other RFFAs located on federally administered lands. The Project contribution to cumulative impacts would also be minimized from the siting of the alternative routes within existing disturbance to the extent possible.

4.4.24.3.5 White-tailed Prairie Dog

Cumulative effects on white-tailed prairie dog are expected with all alternative routes, as mapped habitat would be crossed by all alternative routes. Cumulative effects on white-tailed prairie dogs could include habitat loss, displacement, and fragmentation. However, the Project contribution to cumulative effects is expected to be relatively low due to implementation of design features, such as preconstruction surveys for sensitive species (Design Feature 1), and agency-required mitigation measures, including spatial restrictions (Agency-Required Mitigation Measure 7). It can be assumed that similar measures would be required for other RFFAs located on federally administered lands. The Project contribution to cumulative impacts would also be minimized from the siting of the alternative routes within existing disturbance to the extent possible.

4.4.24.3.6 Pygmy Rabbit

Cumulative effects on pygmy rabbit habitat are anticipated with all alternative routes, as mapped habitat would be crossed by all alternative routes. Cumulative effects on pygmy rabbits could include habitat loss, displacement, and fragmentation. However, the Project contribution to cumulative effects is expected to be relatively low due to implementation of design features, such as preconstruction surveys for sensitive species (Design Feature 1), and agency-required mitigation measures, including seasonal restrictions (Agency-Required Mitigation Measure 7). It can be assumed that similar measures would be required for other RFFAs located on federally administered lands. The Project contribution to cumulative impacts would also be minimized from the siting of the alternative routes within existing disturbance to the extent possible.

4.4.24.3.7 Fringed Myotis, Long-Eared Myotis, and Townsend's Big-Eared Bat

Cumulative effects on long-eared myotis habitat are anticipated from all alternative routes in all segments and on Townsend's big-eared bat habitat in Segment 3, as mapped habitat is crossed by all alternative routes in these segments. However, no fringed myotis habitat is crossed by any other alternative routes and, therefore, cumulative effects are not expected.

Cumulative effects on fringed myotis, long-eared myotis, and Townsend's big-eared bat could include habitat loss, displacement, and fragmentation. However, the Project contribution to cumulative effects is expected to be relatively low due to implementation of protective measures, including spatial restrictions (Agency-Required Mitigation Measure 7). It can be assumed that similar measures would be required for other RFFAs located on federally administered lands. The Project contribution to cumulative impacts would also be minimized from the siting of the alternative routes within existing disturbance to the extent possible.

4.5 Additional Appropriate Mitigation

Additional appropriate mitigation is intended to offset or compensate for the remaining residual impacts after all appropriate and practicable avoidance and minimization measures have been applied, by replacing or providing substitute resources or environments (see 40 CFR 1508.20) through the restoration, establishment, enhancement, or preservation of resources and their values, services, and functions.

4.5.1 Potentially Affected Resources

Potentially affected resources include the resources that occur in the Project area and analyzed in the EIS. These resources were selected based on federal regulatory requirements and policies, concerns of the lead and cooperating agencies, and/or issues derived from comments expressed by agencies and the public during scoping.

4.5.2 Management Goals and Objectives for Potentially Affected Resources

Management goals and objectives for potentially affected resources can be found in the applicable BLM Approved RMPs and RODs (refer to Section 1.6.2.1). Management goals and objectives from applicable BLM RMPs for potentially affected resources inform the appropriate mitigation standards and desired outcomes. Current science, research, and input from entities with special expertise or authority provide additional insight for appropriate mitigation standards and desired outcomes.

Cultural resources, including NHTs, were not considered to have additional mitigation needs that could not be addressed through the mitigation of adverse effects on historic properties as part of the Section 106 process.

4.5.3 Baseline Conditions and Trends for Potentially Affected Resources

The baseline conditions and trends for the potentially affected resources are described in the respective resource sections in Chapter 3 (Affected Environment) of this EIS. The potential for conditions and trends to change as a result of the Project are described in Sections 4.3 and 4.4.

4.5.4 Project Mitigation Strategy and Mitigation Hierarchy

The sequence of mitigation action would be the mitigation hierarchy (avoid, minimize, rectify, reduce or eliminate over time, compensate) as identified by the White House CEQ (40 CFR 1508.20).

The priority is to mitigate impacts at the site of the activity in conformance with the land-use plan goals and objectives through impact avoidance and minimization, including those measures described in laws, regulations, policies, and land-use plans. When these types of mitigation measures are not sufficient to ameliorate anticipated direct, indirect, and cumulative impacts and residual impacts remain, additional appropriate mitigation measures to reduce these residual impacts to meet applicable land-use plan goals and objectives would be required.

After initial impacts were identified for each resource, the BLM determined whether agency-required mitigation measures were needed to avoid and minimize Project effects. The agency-required mitigation measures that would be applied to avoid and minimize Project effects are identified in the Mitigation Planning and Effectiveness subsection for each resource in Section 4.3. Also, the agency-required mitigation measures are summarized in Table 4-2. These measures comprise the first steps of the Project

mitigation strategy and hierarchy. Appendix C presents the mitigation strategy and hierarchy for the Agency Preferred Alternative by resource.

In general, the identified strategies to avoid and minimize impacts are presumed to be effective at reducing potential impacts on an acceptable level. Residual adverse impacts remaining after the application of the first steps of the mitigation hierarchy are considered for additional appropriate mitigation.

4.5.5 Project Mitigation Framework

Appendix C summarizes BLM's assessment of all potential impacts that could result from the Project and the residual adverse impacts that could remain after application of the avoidance and minimization measures included in the Project mitigation strategy and hierarchy. Reasonably foreseeable residual effects on resources that are expected to remain after the application of mitigation measures that would (1) inhibit achieving compliance with laws, regulations, and/or policies or (2) land-use plans objectives would be subject to additional appropriate mitigation. This approach is consistent with the policy direction cited in Section 2.2.8.1.2 as well as the BLM's obligations under FLPMA, NEPA of 1969, MLA of 1920, as amended, and CEQ Regulations.

The following sections describe the results of the BLM's assessment and identify resources with residual impacts that do not warrant additional appropriate mitigation and those residual impacts that warrant additional appropriate mitigation and the rationale.

4.5.5.1 Resources with Residual Impacts Not Warranting Additional Appropriate Mitigation

Following the identification of the potential impacts that could remain after application of the avoidance and minimization measures included in the Project mitigation strategy, the BLM determined that the following resources did not have remaining residual impacts that met the criteria described above and do not warrant additional appropriate mitigation (refer to Appendix C). In general, the BLM determined that the nature and extent of predicted residual effects on these resources identified through the NEPA process indicates the effects would be minor, localized, or temporary and, therefore, do not warrant additional mitigation. Also, the residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies.

- Air quality (including GHG emissions and climate change)
- Cultural resources
- Fish and aquatic resources
- Geology and topography
- Lands and realty
- Livestock grazing
- National Trails System
- Native American Concerns
- Lands with wilderness characteristics
- Paleontological resources
- Recreation
- Soils
- Special designations
- Transportation and access
- Vegetation
- Water resources
- Wetlands and riparian areas

- Wild horses and burros
- Wildlife
    - Bird species
    - Mammals
    - Big game
    - Greater sage-grouse (habitat fragmentation; increased avian presence and predation; population decline)

Regarding greater sage-grouse, habitat fragmentation would largely be avoided through reclamation (Agency-Required Mitigation Measure 8) and minimizing habitat disturbance (Agency-Required Mitigation Measures 3 and 10). The nature and extent of residual effects associated with disturbance from Project activities during construction (i.e., in the short-term) that were identified through the NEPA process do not warrant additional appropriate mitigation to mitigate for temporary habitat fragmentation. Residual effects would not inhibit achieving compliance with laws, regulations, and/or policies.

Further, while the MLVs (i.e., in GHMA; the Applicant will use solar-powered MLVs in PHMA) could provide perching opportunities and the potential for increase in avian predation and the short-term loss of cover from construction of the pipeline could result in increased predation (i.e., creation of a corridor for predators until interim or intense reclamation (Agency-Required Mitigation Measure 8), the nature and extent of residual effects associated with the presence of distribution lines to MLVs in GHMA that were identified through the NEPA process do not warrant additional mitigation to mitigate for the resulting increased avian presence from introduced perching opportunities. Interim and intense reclamation (Agency-Required Mitigation Measure 8) in areas where the pipeline does not follow existing disturbance will be sufficient to restore/rectify short-term loss of cover and avoid or minimize increased predation from the creation of a corridor for predators. Thus, additional mitigation for this type of indirect effect is not warranted to achieve Wyoming ARMPA objectives or compliance with laws, regulations, and/or policies.

Finally, the presence of the pipeline should not decrease nest success or hen survival. Habitat loss or conversion due to surface disturbance, as an indirect effect, could cause the population to respond to these changes. However, the nature and extent of residual effects associated with disturbance from Project activities during construction that were identified through the NEPA process do not warrant additional mitigation.

4.5.5.2 Resources with Residual Impacts Warranting Additional Appropriate Mitigation

Following the assessment of the potential impacts that could remain after application of the avoidance and minimization measures included in the Project mitigation strategy, the BLM determined the residual impact on greater sage-grouse, specifically temporary habitat loss, would inhibit achieving Wyoming ARMPA objectives and would warrant additional mitigation. The rationale is described below. Refer to Appendix C for additional detail on the potential impacts associated with the Project, the overall Project mitigation strategy, and the residual adverse impacts.

4.5.5.2.1 Greater Sage-Grouse

4.5.5.2.1.1 Residual Impact—Temporary Habitat Loss (Direct Effects)

Temporary habitat loss would largely be avoided through reclamation (Agency-Required Mitigation Measure 8) and minimizing habitat disturbance (Agency-Required Mitigation Measures 3 and 10); however, reclamation will take years, short-term removal of existing vegetation could contribute to temporary habitat loss.

The nature and extent of residual effects associated with disturbance from Project activities during construction (i.e., in the short-term) that were identified through the NEPA process warrant additional appropriate mitigation to mitigate for temporary habitat loss. Without additional mitigation, the residual effects would inhibit achieving Wyoming ARMPA objectives.

In Segment 2, the Agency Preferred Alternative (Alternative 2A: Proposed Action) would result in 4.58 percent disturbance in PHMA. The Applicant and BLM worked closely together to identify opportunities to avoid and minimize impacts on PHMA. Residual effects would not inhibit achieving compliance with laws, regulations, and/or policies.

4.5.5.2.1.2 Additional Appropriate Mitigation

- Standard: Net conservation gain
- Objective 1: To recompense for habitat loss or conversion
- Measure(s): Purchase additional habitat of same quality in the same region; a mitigation banking program could be pursued.

4.5.5.3 Monitoring, Reporting, and Adaptation of Additional Mitigation Projects

When applying mitigation at any level of the mitigation hierarchy, there would be requirements for monitoring the effectiveness of the mitigation as well as the durability of the mitigation. This monitoring is necessary, especially in relation to durability for mitigation to identify when it may be appropriate to consider applying adaptive management concepts to ensure continued durability for the life of the Project.

The BLM would require that mitigation measures have a degree of protective durability. Financial protections (e.g., bonding for construction, endowment for mitigation management) are an important tool to achieve protective durability. The BLM would expressly condition its approval of the Project on the Applicant's commitment to perform or cover the costs of mitigation, both onsite and outside the area of impact.

4.6 Irretrievable and Irreversible Commitment of Resources

An irreversible or irretrievable commitment of resources refers to impacts on or losses to resources that cannot be recovered or reversed. Examples include permanent conversion of wetlands or permanent loss of cultural resources, soils, wildlife, agriculture, and socioeconomic conditions. Irreversible is a term that describes the loss of future options. It applies primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over long periods of time. Irretrievable is a term that applies to the loss of production, harvest, or use of natural resources. For example, if farm land is used for a nonagricultural event, some or all the agricultural production from an area of farm land is lost irretrievably while the area is temporarily used for another purpose. The production lost is irretrievable, but the action is not irreversible.

The RRNP would require an irretrievable commitment of natural resources from direct consumption of fossil fuels and construction materials. In addition, the purpose of the Project is to irreversibly and irretrievably use natural gas resources. Additional resource commitments are shown in Table 4-207.

Table 4-207 Summary of Irreversible, Irretrievable Commitment of Resources by the Project			
Resource	**Irreversible Impacts**	**Irretrievable Impacts**	**Explanation**
Air Quality and Climate Change	Yes	Yes	Project emissions would be controlled to not exceed federal or state air quality standards. Some temporary degradation to air quality and climate during construction would occur, resulting in an irretrievable impact. Longer-term degradation to air quality and climate would occur due to the operation of the Riley Ridge Sweetening Plant, resulting in an irretrievable impact. Long-and short-term air quality impacts from operation of the pipeline would be negligible and would not be irreversible. Long-term impacts on global climates from injecting CO_2 into the ground are unquantifiable, but any impacts that might occur would be long-lived and essentially irreversible within a scope of generations.
Cultural Resources	Yes	Yes	Irreversible and irretrievable loss of both known and unknown cultural resources in the Project study area would occur as a result of the implementation of the Proposed Action. Examples include damage to resources during construction or changes in public accessibility (e.g., unauthorized use of access roads). Cultural resources, once destroyed or altered, cannot be replaced. The Programmatic Agreement and the HPTPs describe how adverse effects on historic properties will be avoided, minimized, or mitigated.
Fish and Aquatic Resources	Yes	Yes	Both irreversible and irretrievable commitments are minimized and managed by the CWA and the Rivers and Harbors Act regulations to avoid, minimize, and mitigate permitted Project activities that affect aquatic surface water resources. Similarly, these commitments are regulated for sensitive species of fish and fishery resources by the ESA, BLM, and WGFD.
Geology and Topography	Yes	Yes	The limitation or prevention of extraction of a mineral resource would be an irretrievable loss in areas where the Project right-of-way or Project facilities cross a mineral resource. This impact would be irreversible if the pipeline and associated facilities permanently preclude access to mineral resources.
Lands and Realty	No	Yes	Public property, existing utilities, and authorized and pending rights-of-way would be maintained. Land-use types required for the operation of the pipeline would be an irreversible impact.
Livestock Grazing	Yes	Yes	Removal or permanent disturbance of rangeland or crops used for livestock grazing could create irretrievable and irreversible impacts.

Table 4-207 Summary of Irreversible, Irretrievable Commitment of Resources by the Project			
Resource	**Irreversible Impacts**	**Irretrievable Impacts**	**Explanation**
National Trails System	Yes	Yes	Irreversible and irretrievable impacts on the visual setting of the national trails would be expected based on the presence of permanent above-ground facilities. Through application of agency-required mitigation measures, however, no irreversible or irretrievable impacts would occur on the physical trail alignments, trail traces, or associated sites.
Native American Concerns	Yes	Yes	Irreversible and irretrievable loss of both known and unknown cultural resources of Native American concern (including potential TCPs) within the Project study area would occur as a result of the implementation of the Proposed Action. Examples include damage to locations and resources during construction or changes in public accessibility (e.g., unauthorized use of access roads). Cultural resources of Native American concern, once destroyed or altered, cannot be replaced. Per comments received from the tribes during consultation, the Boars Tusk would be irretrievably and irreversibly altered by the implementation of the Project under Alternative 2B: Southern Route. The implementation of the Project also would result in irreversible and irretrievable loss of other resources of Native American concern; these include, but are not limited to, wildlife and their habitats (disturbance to and/or loss of habitat and wildlife species), ethnobotanical resources (disturbance to and/or loss of vegetation), water sources (rivers, streams, creeks or underground aquifers), and plant-gathering locations and hunting areas.
Noise	No	Yes	Construction will cause short-term, temporary noise effects. The Riley Ridge Sweetening Plant operations will be clearly audible and, therefore, change the acoustical environment within 0.9 mile of the plant, resulting in an irretrievable impact.
Lands with Wilderness Characteristics	Yes	Yes	Only Alternative 2A: Proposed Action would have both irreversible and irretrievable impacts on lands with wilderness characteristics. However, the removal of 131.7 acres from the contiguous unit WY040-2011-059 would not affect the long-term management of the remaining acreage (7,882 acres).
Paleontological Resources	Yes	Yes	Removal of paleontological resources or disturbance of geologic units containing paleontological resources would result in

Table 4-207 Summary of Irreversible, Irretrievable Commitment of Resources by the Project			
Resource	**Irreversible Impacts**	**Irretrievable Impacts**	**Explanation**
			irretrievable and irreversible loss of contextual data.
Public Health and Safety	Yes	Yes	Generation and disposal of solid wastes for construction, operation, and maintenance of the Project will result in both irreversible and irretrievable impacts by adding waste to landfills throughout the Project area.
Recreation	No	Yes	Loss of access to recreation areas and physical disturbance of recreation values would result in irretrievable monetary losses related to tourism and special recreation use permits.
Social and Economic Conditions	No	Yes	There would be increased use of local contractors during construction of the pipeline and Riley Ridge Sweetening Plant. Non-local workforce demands would affect infrastructure resources. This represents irretrievable loss of workers and infrastructure during the construction phase.
Soils and Reclamation	No	Yes	Soil lost to increased erosion and vegetation production lost to conversion of land uses would be irretrievable losses.
Special Designations and Other Management Areas	Yes	No	Because the Project would be entering other management areas in locations with no utility corridors, it is setting a precedent for an established corridor, increasing the likelihood that additional future utilities will be permitted through the management areas at this location.
Transportation and Access	Yes	Yes	There would be an increase in truck traffic on existing roads and additional wear and maintenance requirements during construction.
Vegetation	Yes	Yes	Surface-disturbing activities that remove native vegetation or disturbed topsoil from the Project area could cumulatively and incrementally contribute to the available habitat and the introduction and spread of invasive and noxious weeds. The introduction and presence of weeds could include: ▪ Competition with and possible elimination of native plants; ▪ Increased soil erosion and dust; ▪ Fragmentation of native vegetative communities; ▪ A reduction in the overall value of native vegetative communities leading to a reduction in forage for wildlife species; ▪ Change in the visual character of the area.
Visual Resources	Yes	Yes	Irreversible and irretrievable impacts on visual resources would be expected based on the permanent above-ground facilities associated with the Project, along with physical disturbances to rock formations that cannot be fully replicated through mitigation. No irreversible or

Table 4-207 Summary of Irreversible, Irretrievable Commitment of Resources by the Project			
Resource	**Irreversible Impacts**	**Irretrievable Impacts**	**Explanation**
			irretrievable impacts would be expected in association with temporary facilities or vegetation/soil disturbances, as these would be reclaimed, and appear similar to the existing landscape over time.
Water Resources	Yes	Yes	Ground disturbance from construction and operation of the Project has the potential for localized short-term, adverse cumulative effects on water resources in the Project area. Short-term impacts could be attributed to degrading the quality of waters from sedimentation as a result of destabilization of sensitive soils and modification of upland, riparian, and wetland vegetation.
Wetlands and Riparian Areas	No	No	There are no irreversible impacts expected on wetlands and riparian resources as a result of the Project. Ground-disturbing activities near wetlands and riparian areas will be reclaimed.
Wild Horse and Burros	Yes	Yes	Removal or permanent disturbance of rangeland used for wild horse and burros grazing could create irretrievable and irreversible impacts.
Wildlife	Yes	Yes	Irreversible commitments are habitat loss and reduced population viability or extinction. Irretrievable commitments are temporary habitat impacts followed with reclamation, or temporary habitat use disruption resulting in displacement from the disruption source and use of surrounding habitat.

4.7 Relationship of Short-Term Uses to Long-Term Productivity

Effects on resources often are characterized with respect to there being short or long duration. This section is not intended to repeat analysis already provided. Rather, the intent is to present tradeoffs in the relationship between short-term uses of the environment and maintenance and enhancement of long-term productivity of resources. An important consideration when analyzing the effects of the Project is whether it will result in short-term environmental effects (adverse or beneficial) to the detriment of achieving long-term or maximizing productivity of these resources.

Short term is defined as the construction phase of the Project plus 4 years (6 years total). Long term is defined as the remaining life of the Project through abandonment and reclamation. Many of the impacts associated with this pipeline would be short-term and would cease to be adverse impacts following right-of-way rehabilitation and reclamation. No significant decreases in the productivity of the Project area due to construction activities would be expected.

The Project would result in various short-term adverse impacts, such as the temporary disturbance to soil and vegetation in the construction zone, temporary disruptions to traffic, reduced access to recreation areas, increased noise, increased fugitive dust, destruction of cultural resources, and social and economic impacts on the local infrastructure. Short-term impacts are expected to end on completion of construction.

Long-term impacts would be minimized through implementation of Applicant-committed measures (refer to Chapter 2.2.17 Applicant-Committed Design Features and Agency-Required Mitigation). Revegetation of disturbed areas is expected to stabilize disturbed surfaces and control erosion.

Proper mitigation and compliance with Section 106 and consultation with appropriate Native American tribes would reduce, but not eliminate, effects on historic properties and properties of traditional or spiritual importance to tribes. Regardless of whether the stated use is short or long term, physical impacts on these resources are permanent.

Adverse visual impacts associated with temporary impacts would lessen with time after the landscape is reclaimed and vegetation becomes established. However, the permanent above-ground facilities associated with the Project would continue to alter the visual qualities of the landscape. These permanent changes to the landscape would affect the visual resources and visual/historic settings of the national trails if the permanent above-ground facilities exist.

No significant impacts are anticipated for the routine operation of the Project. On completion of the construction phase, soils and vegetation would return to normal long-term productivity levels. Agency-Required mitigation measures would be incorporated to attempt to minimize long-term productivity effects.

THIS PAGE INTENTIONALLY LEFT BLANK.

Chapter 5 – Consultation and Coordination

Chapter 5 – Consultation and Coordination

5.1 Introduction

Integrated with the planning, analysis, and review activities of EIS preparation, the BLM is conducting a comprehensive program of agency coordination and public participation, commencing with scoping early on and continuing throughout the NEPA process. The intent of the program is to proactively encourage interaction between the BLM and other federal and state agencies, local governments, Native American tribes, and the public to keep them informed about the proposed RRNP through dissemination of information and to solicit information that assists in analysis and decision-making.

Throughout the preparation of this document, formal and informal efforts have been implemented by the BLM to involve, consult with, and coordinate with other federal and state agencies and local governments, Native American tribes, and the public. Such communication is important (1) to ensure the most appropriate data have been gathered and employed for analysis and (2) to ensure agency policy and public sentiment and values are considered and incorporated into informed decision-making.

This chapter provides a brief description of the methods employed for communication and interaction, including consultation and coordination with agencies, tribes, and stakeholders; the scoping process; and public review of the EIS.

5.2 Consultation and Coordination

A NOI to Prepare an EIS for the Proposed Project was published in the *Federal Register* on June 9, 2014, which initiated a formal scoping period. As noted in the NOI, the formal scoping period was initially intended to end on July 9, 2014; however, on June 27, 2014, the BLM announced that the formal scoping period would be extended until August 1, 2014.

5.2.1 Cooperating Agencies

In conformance with CEQ regulations implementing NEPA, the BLM invited 56 federal and state agencies, Native American tribes, and local governmental entities to participate as cooperating agencies in the preparation of the EIS (40 CFR 1501.6). Formal letters inviting tribes and local, state, and federal agencies to participate as cooperating agencies in the preparation of the EIS were sent on July 18, 2014. Of the 56 invited, 13 accepted the invitation and are participating. Following is a list of the agencies invited, and those participating are marked with an asterisk.

Federal

- USFWS – Wyoming, Ecological Services*
- NPS – National Trails*
- USACE*
- EPA, Region 8 (EPR-N)
- USFS
- DOE
    - Office of Compliance
    - Office of Legacy Management
    - Western Area Power Administration
- USDOT – PHMSA

Tribes

- Cheyenne River Sioux Tribe
- Comanche Nation of Oklahoma
- Crow Creek Sioux Tribe
- Crow Tribe
- Eastern Shoshone Tribe of the Wind River Reservation
- Fort Peck Assiniboine and Sioux Tribes
- Northern Arapaho Tribe of the Wind River Reservation
- Northern Cheyenne Tribe
- Oglala Sioux Tribe
- Rosebud Sioux Tribe
- Shoshone-Bannock Tribes of the Fort Hall Reservation
- Sisseton-Wahpeton Oyate Tribes
- Standing Rock Sioux Tribe
- Ute Indian Tribe of the Uintah and Ouray Reservation
- Yankton Sioux Tribe

Wyoming State Agencies

- State of Wyoming Office of the Governor (and the following associated departments)*
    - State of Wyoming Administration
    - State of Wyoming Department of Agriculture Natural Resources and Policy Division
    - State of Wyoming Department of Revenue
    - State of Wyoming Department of Transportation
    - State of Wyoming Game and Fish Department
    - State of Wyoming Geological Survey
    - State of Wyoming Governor's Policy Office
    - State of Wyoming Industrial Siting Division
    - State of Wyoming Land Quality Division
    - State of Wyoming Office of State Lands and Investments
    - State Historic Preservation Office
    - State of Wyoming State Parks, Historic Sites, and Trails
    - State of Wyoming Travel and Tourism
    - State of Wyoming Water Quality Division

Local

- Fremont County, Wyoming*
- Lincoln County, Wyoming Commissioners*
- Sublette County, Wyoming*
- Sweetwater County, Wyoming*
- Natrona County, Wyoming*
- Natrona County Conservation District*
- Popo Agie Conservation District*
- Sublette County Conservation District*
- Sweetwater County Conservation District*
- Dubois-Crowheart Conservation District
- Lower Wind River Conservation District
- Medicine Bow Conservation District
- Saratoga-Encampment-Rawlins Conservation District

- Carbon County, Wyoming
- City of Green River, Wyoming
- City of Rock Springs, Wyoming
- City of Rawlins, Wyoming
- City of Riverton, Wyoming
- Town of Big Piney, Wyoming
- Town of Granger, Wyoming
- Town of Hanna, Wyoming
- Town of LaBarge, Wyoming
- Town of Lander, Wyoming
- Town of Marbelton, Wyoming
- Town of Medicine Bow, Wyoming
- Town of Pinedale, Wyoming
- Town of Sinclair, Wyoming
- Town of Superior, Wyoming
- Town of Wamsutter, Wyoming

5.2.2 Consultation

The BLM is required to prepare EISs in coordination with any studies or analyses required by the Fish and Wildlife Conservation Act (16 U.S.C. 661 et seq.), ESA (16 U.S.C. 1531 et seq.), and the NHPA (54 U.S.C. 300101 et seq.), as amended. In accordance with Executive Order 13175, the BLM must consult, government-to-government, with Native American tribes to ensure the tribes are informed about actions that may affect them.

5.2.2.1 Biological Resources

Under the provisions of Section 7(a)(2) of the ESA, a federal agency that carries out, permits, licenses, funds, or otherwise authorizes an activity must consult with the USFWS, as appropriate, to ensure that the action is not likely to jeopardize the continued existence of any species listed under the ESA or to result in the destruction or adverse modification of designated critical habitat. During preparation of the environmental analysis, the BLM informally consulted with the USFWS regarding the effects of the Project on yellow-billed cuckoo.

Formal consultation on this issue, as well as the issue of water depletions, if warranted, will begin during discussion of the agency preferred alternative after publication of the Draft EIS.

5.2.2.2 Cultural Resources

Section 106 (54 U.S.C. 306108) of the NHPA requires federal agencies to take into account the effect of their undertakings on any district, site, building, structure, or object that is included in or is eligible for inclusion in the NRHP. Regulations for the implementation of Section 106 are defined in 36 CFR Part 800 – Protection of Historic Properties. These regulations define how federal agencies meet their statutory responsibilities as required under the law. The Section 106 process seeks to accommodate historic preservation concerns with the needs of federal undertakings through consultation among the agency official and other parties with an interest in the effects of the undertaking on historic properties (36 CFR 800.1 and 36 CFR 800.2). These parties include the ACHP, SHPO, Native American tribes, state and other federal agencies, and individuals or organizations with a demonstrated interest in the undertaking due to their legal or economic relation to the undertaking or affected properties or their concern with the effects of undertakings on historic properties.

The BLM, as lead federal agency for compliance with Section 106 of the NHPA, initiated Section 106 consultation with the SHPO and others pursuant to 36 CFR Part 800.6 and 800.14(b) of the ACHP's

regulations in July 2014. The Section 106 process is separate from but is often conducted parallel with the preparation of an EIS. Consultation under Section 106 of the NHPA is ongoing and will continue during post-EIS phases of RRNP implementation.

The BLM, in consultation with the Wyoming SHPO, agreed to develop a Programmatic Agreement among the various state and federal agencies and consulting parties with an interest in the Project. A Programmatic Agreement outlines the stipulations that will be followed concerning the identification, assessment, and treatment of historic properties for the Project in accordance with 36 CFR 800.15(b). Signatories agree that the Project will be administered in accordance with stipulations and measures set forth in the Programmatic Agreement. To date, the signatory parties include the BLM, the NPS Intermountain Region, the Omaha District of the USACE, and the Wyoming SHPO. The ACHP has declined to participate in consultation.

Consulting parties include the following:

- Alliance for Historic Wyoming
- Natrona County Commission, Wyoming
- Oregon-California Trail Association
- Sublette County Commission, Wyoming
- Sweetwater County Commission, Wyoming
- Cheyenne River Sioux Tribe
- Comanche Nation of Oklahoma
- Crow Creek Sioux Tribe
- Crow Tribe
- Eastern Shoshone Tribe of the Wind River Reservation
- Fort Peck Assiniboine and Sioux Tribes
- Northern Arapaho Tribe of the Wind River Reservation
- Northern Cheyenne Tribe
- Oglala Sioux Tribe
- Standing Rock Sioux Tribe
- Rosebud Sioux Tribe
- Shoshone-Bannock Tribes of the Fort Hall Reservation
- Ute Indian Tribe of the Uintah and Ouray Reservation
- Yankton Sioux Tribe

The Sisseton-Wahpeton Oyate Tribes declined to participate in consultation on the RRNP. Through the development of a Programmatic Agreement, the BLM and cooperating agencies have outlined a phased approach to fulfill the four requirements of Section 106: initiate consultation, identify historic properties, assess adverse effects, and resolve adverse effects. The first requirement parallels the NEPA processes of drafting the EIS, conducting public hearings/workshops, and finalizing the EIS. The steps of identifying historic properties and assessing adverse effects will be completed after the ROD is signed and the BLM issues the right-of-way grant. The final step in the Section 106 process is the resolution of adverse effects, which will be guided by the HPTP. The Programmatic Agreement will be complete prior to issuance of the ROD; however, stipulations will need to be included in the right-of-way grant requiring completion of agency-approved treatment of historic properties identified by agency archaeologists as needing further investigation before any Project-related ground-disturbing activities commence in the vicinity of the historic properties. If stipulations are included in the right-of-way grant, the Authorized Officer would issue a Notice to Proceed upon satisfactory completion of each investigation or mitigation effort.

NHTs are a concern for the RRNP study area. The BLM has coordinated with the cooperating counties, the Alliance for Historic Wyoming, the NPS, and the Oregon-California Trails Association. The BLM

invited the National Pony Express Trail Association and the Mormon Trails Association to be consulting parties, but they declined. On September 1, 2015, the BLM hosted a tour of NHT locations that may be affected by the RRNP to address specific concerns and provide explanation of design features and mitigation measures that will be incorporated into the Project.

The Programmatic Agreement is in draft form at present and is included in the Draft EIS as Appendix B, and, thus, the public may provide comment.

5.2.2.3 Native American Tribal Consultation

The United States has a unique legal relationship with Native American tribal governments, as set forth in the Constitution of the United States, treaties, executive orders (e.g., Executive Order 13175), federal statutes, federal policy, and tribal requirements, which establish the interaction that must take place between federal and tribal governments. An important basis for this relationship is the trust responsibility of the United States to protect tribal sovereignty, self-determination, tribal lands, tribal assets and resources, and treaty and other federally recognized and reserved rights. Government-to-government consultation is the process of seeking, discussing, and considering views on policy, and/or, in the case of this RRNP, environmental and cultural resource management issues. As part of the BLM's ongoing government-to-government consultation, tribal officials were informed of the RRNP and those who expressed interest in the Project will be consulted on the status of the RRNP, through the completion of the NEPA and Section 106 processes. Government-to-government consultation activities often are combined with Section 106 tribal consultation activities.

For a list of federal and state legislation applicable to tribal consultation in the Project study area, please refer to Section 3.2.8.1.

Early in the NEPA process, the BLM, in coordination with federal and state cooperating agencies, identified 14 Native American tribes that may have a traditional association with the Project area (Cheyenne River Sioux Tribe, Crow Tribe, Crow Creek Sioux Tribe, Eastern Shoshone Tribe of the Wind River Reservation, Fort Peck Assiniboine and Sioux Tribes, Northern Arapaho Tribe of the Wind River Reservation, Northern Cheyenne Tribe, Oglala Sioux Tribe, Rosebud Sioux Tribe, Shoshone-Bannock Tribes of the Fort Hall Reservation, Sisseton-Wahpeton Oyate Tribes, Standing Rock Sioux Tribe, Ute Indian Tribe of the Uintah and Ouray Reservation, and Yankton Sioux Tribe). The BLM initiated contact with the tribes in accordance with various environmental laws and executive orders. Initial contact with Native American tribes began on September 27, 2013, with a pre-application informational letter introducing the proposed undertaking; soliciting feedback about concerns the tribes might have regarding the possible presence of TCPs or places of cultural, traditional, or spiritual importance in the Project area; and inviting them to attend the pre-application meetings. The pre-application meetings were held in Gillette, Wyoming, on October 30, 2013; in Lander, Wyoming, on October 31, 2013; and in Rock Springs, Wyoming, on November 1, 2013. The Tribal Historic Preservation Officer (THPO) for the Northern Arapaho Tribe of the Wind River Reservation was the sole tribal attendee at these pre-application meetings.

In letters dated July 9, 2014, the BLM initiated government-to-government consultation with the same 14 aforementioned Native American tribes. The BLM sent letters to the 14 Native American tribes and invited the tribes to participate in the Section 106 process as consulting parties and as cooperating agencies in the NEPA process. The letters notified the tribes of scheduled scoping meetings in Rock Springs, Big Piney, Lander, and Casper, Wyoming. The THPO for the Eastern Shoshone Tribe of the Wind River Reservation attended the scoping meeting in Lander on July 16, 2014. Subsequently, the BLM conducted follow-up telephone calls on August 8, 2014, to tribes that had not responded to the consulting party invitation letter. At the suggestion of the Eastern Shoshone Tribe of the Wind River Reservation, the Comanche Nation of Oklahoma was invited to be a consulting party in April 2015,

bringing the total number of tribes invited to consult to 15 tribes. The Comanche Nation of Oklahoma was asked by the Rock Springs Field Office to participate as a consulting party on April, 30, 2015. During a phone call to the THPO on April 24, 2015, the THPO said that the tribe would like to participate as a consulting party, but no formal acceptance of "consulting party" status has been received from the tribe.

Currently, 14 tribes are consulting parties for the Project, including the Cheyenne River Sioux Tribe, the Comanche Nation of Oklahoma, the Crow Tribe, the Crow Creek Sioux Tribe, the Eastern Shoshone Tribe of the Wind River Reservation, the Fort Peck Assiniboine and Sioux Tribes, the Northern Arapaho Tribe of the Wind River Reservation, the Northern Cheyenne Tribe, the Oglala Sioux Tribe, the Rosebud Sioux Tribe, the Shoshone-Bannock Tribes of the Fort Hall Reservation, the Standing Rock Sioux Tribe, the Ute Indian Tribe of the Uintah and Ouray Reservation, and the Yankton Sioux Tribe. The Sisseton-Wahpeton Oyate Tribes have formally declined to participate in consultation on the RRNP.

The tribes have been added to the RRNP mailing list and will receive regular updates via Project newsletters and public notices documenting the availability of EIS-related documents for review.

As part of the scoping process, several coordination meetings were held with the BLM and tribal representatives to provide an update about Project status, to ask for tribal representatives' views on the identification of places of concern, and to listen to any tribal concerns about the Project. These meetings were held with the Eastern Shoshone Tribe of the Wind River Reservation on July 14, 2014, February 12, 2015, and December 14, 2016; the Northern Arapaho Tribe of the Wind River Reservation on February 12, 2015; and the Ute Indian Tribe of the Uintah and Ouray Reservation on January 22, 2015, May 20, 2015, and October 19, 2016. A larger meeting was coordinated among the Northern Plains tribes in Rapid City, South Dakota, on November 6, 2014. The THPOs for the Cheyenne River Sioux Tribe, the Northern Cheyenne Tribe, and the Crow Tribe were present. In addition, the THPO for the Yankton Sioux Tribe called in to the meeting. The purpose of the meeting was for the BLM and the Applicant to listen to how the tribes would like to see tribal concerns handled as a part of the Section 106 process as it is conducted for the Project, and, in particular, to discuss cultural resources identification efforts. For a list of Native American concerns discussed during the coordination meetings, refer to Section 4.3.8, Table 4-66. In addition to the coordination meetings, Project updates were provided to the Shoshone-Bannock Tribes of the Fort Hall Reservation during a government-to-government meeting between tribal leadership and the BLM agency officials on October 9, 2014, in Fort Hall, Idaho. As part of the agenda for each meeting, the BLM presented the notes from previous coordination meetings with tribes.

A field visit of the Project area was held from September 28 to October 1, 2015, to provide tribal representatives with an overview of the location of the alternative routes, resources, and Project area. The field visit was conducted prior to the identification of the Agency Preferred Alternative so that the tribes would have the opportunity to consider the alternative routes and provide feedback to the BLM. Representatives of eight tribes (Cheyenne River Sioux Tribes, Crow Creek Sioux Tribe, Crow Tribe, Eastern Shoshone Tribe of the Wind River Reservation, Northern Arapahoe Tribe of the Wind River Reservation, Northern Cheyenne Tribe, Rosebud Sioux Tribe, and Shoshone-Bannock Tribes of the Fort Hall Reservation) attended the field visit. The cultural resources sites and areas visited had been identified as of potential concern for the tribes. During the field visit, tribal representatives expressed concern pertaining to the Project, in general, and effects on culturally significant places and potentially significant sites and provided management recommendations for cultural resources. For further information regarding Native American concerns expressed during the field visit, refer to Section 4.3.8.1.

A consultation meeting took place with the THPO of the Eastern Shoshone Tribe of the Wind River Reservation on December 14, 2016. The purpose of the meeting was to provide the THPO with an update on the Project, to provide information and ask for tribal views on the proposed crossing of the Green River by the pipeline, and to listen to any other tribal concerns about the Project.

The current status of tribal participation is summarized below:

- The BLM conducted pre-application meetings with tribes in October and November 2013.
- Fifteen Native American tribes have been contacted.
- Fourteen Native American tribes (Cheyenne River Sioux Tribe, Comanche Nation of Oklahoma, Crow Tribe, Crow Creek Sioux Tribe, Eastern Shoshone Tribe of the Wind River Reservation, Fort Peck Assiniboine and Sioux Tribes, Northern Arapaho Tribe of the Wind River Reservation, Northern Cheyenne Tribe, Oglala Sioux Tribe, Rosebud Sioux Tribe, Shoshone-Bannock Tribes of the Fort Hall Reservation, Standing Rock Sioux Tribe, Ute Indian Tribe of the Uintah and Ouray Reservation, and Yankton Sioux Tribe) are participating as consulting parties.
- The Sisseton-Wahpeton Oyate Tribes have formally declined consulting party status under the NHPA but would like to continue to receive information gathered during the NEPA process.
- As of the date of this Draft EIS, face-to-face meetings with tribal representatives, mainly THPOs or cultural resources staff, have taken place with eight tribes: the Cheyenne River Sioux Tribe, the Crow Tribe, the Eastern Shoshone Tribe of the Wind River Reservation, the Northern Arapaho Tribe of the Wind River Reservation, the Rosebud Sioux Tribe, the Northern Cheyenne Tribe, the Shoshone-Bannock Tribes of the Fort Hall Reservation, and the Ute Indian Tribe of the Uintah and Ouray Reservation. A government-to-government consultation meeting has taken place with the Shoshone-Bannock Tribes of the Fort Hall Reservation.
- Eleven Northern Plains Tribes were invited to a meeting in Rapid City, South Dakota, to learn more about the Project and express any initial concerns.
- Representatives of the Rosebud Sioux THPO have participated in Project conference calls and reviews.
- All tribes were invited to attend a field visit of the RRNP alternative routes from September 28 through October 1, 2015. Representatives of eight tribes (Cheyenne River Sioux Tribes, Crow Creek Sioux Tribe, Crow Tribe, Eastern Shoshone Tribe of the Wind River Reservation, Northern Arapahoe Tribe of the Wind River Reservation, Northern Cheyenne Tribe, Rosebud Sioux Tribe, and Shoshone-Bannock Tribes of the Fort Hall Reservation) attended.
- Letters were sent to all tribes on October 28, 2015, requesting their input regarding the RRNP alternative routes.
- A conference call for all tribes to solicit their input on RRNP alternative routes took place on November 10, 2015.
- Tribal consultation is ongoing for this Project, in the form of continued status updates and consultation meetings and conference calls among the participating tribes.
- Specific detailed records of the field visit, meetings, and documentation of other communications are on file in the Project administrative record.
- The BLM will safeguard any information that the tribes wish to remain confidential to the fullest extent of the law.

5.3 Summary of Agency and Public Scoping

Public scoping meetings were held on July 14, 15, 16, and 17, 2014. Additional contacts were made throughout the process to clarify or update information. This section describes the consultation and coordination activities that have taken place throughout the NEPA process.

Agency and public scoping is purposefully conducted early in the EIS process and is open to all interested agencies and the public. The intent is to solicit comments and identify issues that help direct the approach and depth of the environmental studies and analysis needed to prepare the EIS. Objectives to meet this goal include the following:

- Identify and invite agencies with jurisdiction and/or special expertise relevant to the Project to participate in the preparation of the EIS as cooperating agencies
- Identify other interested parties and invite them to participate in the NEPA process
- Identify other environmental review and consultation requirements
- Identify the relevant and substantive issues that need to be addressed during the studies and in the EIS
- Determine the range of alternatives to be evaluated
- Develop the environmental analysis criteria and systematic process, allocating EIS assignments among agencies, as appropriate

The scoping process is summarized in this section and documented in the *Final Scoping Report for the Draft Environmental Impact Statement for the Riley Ridge to Natrona Project* (BLM 2014), which is available for viewing at the BLM Rock Springs Office and on the BLM website (http://bit.ly/2aW7271). The issues derived from scoping comments are listed in Table 1-3.

5.3.1 Approach

The range of issues summarized in this document was derived from the scoping process and ongoing public participation. Some of the activities implemented early in the RRNP are listed below.

Announcements to inform the public of the RRNP, the EIS preparation, and of the public scoping meetings were published in the *Federal Register* in media releases to local newspapers and radio stations, and as legal notices where applicable.

The BLM published media releases on the Rock Springs Field Office website and the Environmental Notification Bulletin Board during the scoping period. Information relevant to the RRNP can be found at http://bit.ly/2aW7271. A link was provided for the public to submit comments via email at blm_wy_rrnp@blm.gov

Four formal scoping meetings were held in July 2014 to introduce the RRNP, explain the purpose of and need for the RRNP, describe the RRNP, explain the planning and permitting process for the Project, and solicit comments useful for the environmental analysis.

5.3.1.1 Information Dissemination and Notification

As explained in Section 5.2, information about the RRNP was disseminated early in the NEPA process through the *Federal Register*, media releases, legal notices, and website postings.

An NOI was published in the *Federal Register* on June 6, 2014[1], announcing (1) the preparation of the EIS for the proposed RRNP and (2) the opportunity for public input through scoping. The publication of the NOI in the *Federal Register* marked the beginning of EIS preparation and the scoping process.

Media releases and newspaper notices were placed in regional and local newspapers (Table 5-1). Also, the BLM posted RRNP information and announcements of the meetings on the BLM public website in July 2014.

[1]*Federal Register* Vol. 79, No. 2014-13395, pages 32975 -32979

Table 5-1 Media Releases and Legal Notices	
Newspaper Published on July 9 and 27, 2014	
Associated Press Cheyenne	Kemmerer Gazette
Associated Press Denver	News West
Tribune	Pinedale Roundup
JH News and Guide	Sublette Roundup
Casper Star Tribune	Sublette Examiner
Casper Journal	Saratoga Sun
Green River Star	Uinta County Herald
Jackson Hole News	Sublette Times
Jackson Hole News and Guide	Bridge Valley Pioneer
Pinedale Online	Rawlins Times
Silver Star	Laramie Boomerang
DTE World	PC Record Times

5.3.1.1.1 Scoping Meetings

Four scoping meetings were held in July 2014 to inform the public about the RRNP and the NEPA process and to solicit input on the scope of the Project and potential issues. The scoping meetings were held from 4 to 7 p.m. at the following locations:

- July 14 – Holiday Inn, 1675 Sunset Drive, Rock Springs, Wyoming
- July 15 – Marbleton Town Hall, 10700 Highway 189, Big Piney, Wyoming
- July 16 – Rodeway Inn/Pronghorn Lodge, 150 E. Main Street, Lander, Wyoming
- July 17 – Ramada Plaza Riverside, 300 West F. Street, Casper, Wyoming

The locations were chosen based on convenience and accessibility to the public throughout the primary region potentially affected by the Project, capacity of the available facilities.

The format of each meeting was an informal open house. Attendees had the opportunity to sign in, review a variety of handouts, browse through information displays on the Project and the BLM environmental review process, and discuss the Project and the environmental review process with the BLM management and staff and with Denbury representatives.

5.3.1.1.2 Preparers and Contributors

Preparers, contributors, reviewers, and consultants involved throughout the RRNP (including BLM staff) are listed in Table 5-2 and Table 5-3.

Table 5-2
Bureau of Land Management Preparers and Contributors

Name	Field Office, Title	Involvement
Rita Allen	Wind River/Big Horn Basin District Resource Advisor, Minerals	Minerals and lands
Jeremie Artery	Lander Field Office, Natural Resource Specialist	Soils and vegetation
Nancy Baker	Rawlins Field Office, Assistant Field Manager Minerals and Lands	Management
Janet Bellis	Pinedale Field Office, Physical Scientist	Water resources
Phillip Blundell	Rock Springs Field Office, Planning and Environmental Coordinator	Project coordinator; Rock Springs Field Office point of contact
Kathy Boden	Wyoming State Office, Archaeologist	Cultural resources
Brent Breithaupt	Wyoming State Office, Program Lead	Paleontologist
Craig Bromley	Lander Field Office, Archaeologist	Cultural resources
Tony Brown	High Desert District, Public Affairs	Public affairs program lead
Curtis Bryan	Lander Field Office, Supervisory Rangeland Management Specialist	Livestock grazing
Karina Bryan	Lander Field Office, Archaeologist	Cultural resources
Mike Calton	Rawlins Field Office, Range Management Specialist	Livestock grazing
Dennis Carpenter	Rawlins Field Office, Manager	Management
Liz Dailey	Pinedale Field Office, Planning and Environmental Coordinator	Land use resources
Jay D'Ewart	Rock Springs Field Office, Wild Horse Specialist	Wild horses
Dennis Doncaster	Rock Springs Field Office, Hydrologist	Hydrology/soil specialist
Jessey Dowdy	Rock Springs Field Office, Archaeologist	Cultural resources
Sam Drucker	Pinedale Field Office, Archaeologist	Cultural resources
Shane Evans	Casper Field Office, Hydrologist	Water resources
Scott Fluer	Lander Field Office, Wild Horse Specialist	Wild horses
Brett Fahrer	Wyoming State Office, Program Lead	GIS
Thomas Foertsch	High Desert District, Resource Advisor	Minerals and lands lead
Susan Foley	Rawlins Field Office	Soil resources
Jo Foster	Rock Springs Field Office, Outdoor Recreation Planner	Visual resource management/ wilderness/ recreation specialist
Kimberlee Foster	Rock Springs Field Office, Manager	Management
Jim Glennon	Rock Springs Field Office, Botanist	Plants and Soils
Noelle Glines-Bovio	Wyoming State Office, VRM/NCL State Lead	Visual resource management/ wilderness/ recreation specialist
Mark Goertel	Wyoming State Office, Program Lead	Livestock grazing
Jed Gregory	High Desert District, Natural Resource Specialist	GIS
Caleb Hiner	Pinedale Field Office, Field Manager	Management
Beth Holden	Rawlins Field Office, Realty Specialist	Rawlins Field Office alternate point of contact

Table 5-2
Bureau of Land Management Preparers and Contributors

Name	Field Office, Title	Involvement
Anthony Howard	Pinedale Field Office, Range Management Specialist	Livestock grazing
Crystal Hoyt	Rock Springs Field Office, Realty Specialist	Lands and realty
Martin Hudson	Pinedale Field Office, Outdoor Recreation Planner	Visual resource management/ wilderness/ recreation specialist
David Hullum	Rawlins Field Office, Natural Resource Specialist	Visual resource management
Ted Inman	Rock Springs Field Office, Natural Resource Specialist	Natural resources
Natasha Keierleber	Rawlins Field Office, Archaeologist	Cultural resources
Ben Kniola	Lander Field Office, Assistant Field Manager, Minerals and Lands	Management, temporary point of contact (January 23 – May 1, 2016)
Kathleen Lacko	Casper Field Office, Assistant Field Manager, Minerals and Lands	Management
Signa Larralde	National Transmission Support Team, Archaeologist	Cultural resources lead
Debra Larson	Lander Field Office, Land Law Examiner	Land law examiner
Nyle Layton	Rawlins Field Office, Physical Scientist	Minerals
Patrick Lionberger	Rock Springs Field Office, Wildlife Biologist	Biological resources lead
Walt Loewen	Wyoming State Office, Planning and Environmental Specialist	NEPA review coordinator
Gavin Lovell	Rock Springs Field Office, Assistant Field Manager Resources	Management
Mark Mackiewicz	BLM National Project Manager	Project manager
Jessica Montag	Wyoming State Office, Program Lead	Socioeconomic specialist
Pam Murdock	Wyoming State Office, Program Lead	Planning
Joanna Nara-Kloepper	Rock Springs Field Office, Assistant Field Manager, Minerals and Lands	Minerals and lands lead
Mark Newman	Rawlins Field Office, Geologist	Geology
Susan Norman	Wyoming State Office, Program Lead	GIS
Jared Oakleaf	Lander Field Office, Outdoor Recreation Planner	Visual resource management/ wilderness/ recreation specialist
Karl Osvald	Wyoming State Office, Program Lead	Senior geologist, state CO_2/helium lead
Kelly Owens	Rawlins Field Office, Hydrologist	Water resources
Bob Price	Rock Springs Field Office, Supervisory Range Management Specialist	Livestock grazing
Leta Rinker	Lander Field Office, Realty Specialist	Lander Field Office point of contact
Brian Roberts	Pinedale Field Office, Natural Resource Specialist	Soil resources
Matthew Roberts	Casper Field Office, Range Management Specialist	Livestock grazing
John Russell	Rawlins Field Office, RECO Project Manager	Rawlins Field office point of contact
Dennis Saville	Wyoming State Office, Program Lead	Wildlife resources
Ben Smith	Rawlins Field Office, Wild Horse and Burro Specialist	Wild horses and burros

Table 5-2 Bureau of Land Management Preparers and Contributors		
Name	**Field Office, Title**	**Involvement**
eGene Smith	Rock Springs Field Office, Archaeologist/Paleontology Coordinator	Paleontological resources
Lesly Smith	Wyoming State Office, Program Lead	Recreation resources
Scott Stadler	Rock Springs Field Office, Supervisory Archaeologist	Cultural resources
Thomas Sunderland	Lander Field Office, Geologist	Geology
Sandy Taylor	Rawlins Field Office, Wildlife Biologist	Wildlife resources
Art Terry	Casper Field Office, Environmental Protection Specialist	Cultraul Resources
Mark Thonhoff	Pinedale Field Office, Natural Resource Specialist	Wildlife resources
Charis Tuers	Wyoming State Office, Program Lead	Air quality specialist
Rubel Vigil	Lander Field Office, Assistant Field Manager Resources	Management
Richard Vander Voet	Lander Field Office, Field Manager	Management
Tim Vosburgh	Lander Field Office, Wildlife Biologist	Wildlife resources
Bill Wadsworth	Pinedale Field Office, Realty Specialist	Pinedale Field Office point of contact
Timothy Wakefield	High Desert District, District Manager	Management
Ira Waldron	Lander Field Office, Natural Resource Specialist	Natural resources
Jennifer Weber	Casper Field Office, Realty Specialist	Casper Field Office point of contact
Kaci Weinshrott	Casper Field Office, Archaeologist	Cultural resources
Sarah Wempen	Lander Field Office, GIS Specialist	GIS
June Wendlandt	Wyoming State Office Program Lead	Wild horse and burros
Timothy Wilson	Casper Field Office, Field Office Manager	Management
Jim Wright	Casper Field Office, Wildlife Biologist	Wildlife resources
Janelle Wrigley	Wyoming State Office, Realty Officer	Wyoming State Office point of contact
Kristin Yannone	Lander Field Office, Planning and Environmental Coordinator	NEPA review

Table 5-3 Consultant Preparers and Contributors		
Name	**Education**	**Involvement**
Environmental Planning Group LLC		
Anna Allen	BA, English	Editorial review
Jeremy Allinson	BS, Natural Resources	Land use, lands with wilderness characteristics, recreation, special designations
Pamela Blackmore	BLA, Landscape Architecture	Recreation, special designations
Louise Brown	BA, Administrative Systems	Document management
Ivan Contreras	BLA, Landscape Architecture	Visual resources, NHT
Matt Dickinson	MS, Ecology BS, Biology	Wildlife resources
Michael Doyle	MLA, Landscape Architecture BA, Environmental Design	Project Management Oversight
Megan Dunford	MLA, Landscape Architecture BA, Advertising and Interpersonal Communications	Project Coordinator, land use

Table 5-3
Consultant Preparers and Contributors

Name	Education	Involvement
Adrien Elseroad	MS, Forestry BS, Natural Resources	Wildlife resources; technical review of vegetation, water, and fish resources
Naia George	MS, Anthropology (Archaeology/Physical Anthropology) BS, Anthropology	Cultural and historical resources
Dana Holmes	MA, Environmental Planning BA, Environmental Policy	Project NEPA Coordinator, lands with wilderness characteristics, transportation
Craig Johnson	BLA, Landscape Architecture	Visual resources, NHT
Matthew Martin	MS, Urban and Regional Planning BA, Geography	Geospatial analysis and mapping
Amanda O'Connor	MA, Conservation Studies BA, Environmental Biology	Project Manager
Mike Pasenko	MS, Quaternary Sciences Program BA, Anthropology	Earth and water resources, paleontology
Kevin Rauhe	BLA, Landscape Architecture	Visual resources, NHT
Ron Spears	MS, Ecology BA, Biology/Ecology	Biological resources, wetlands and riparian resources
Jennifer Streeter	MS, Geography BS, Geography	Geospatial analysis and mapping
Johanna Tietze	BS, Environmental Studies	References, document development support, administrative record
Heather Weymouth	MS, American Studies (Anthropology) BIS, Anthropology	Cultural and historical resources
Engineering Analytics, Inc.		
Nathan Bolles	MS, Earth Sciences BS, Geology	Geohydrology and soils
Bruce Marshall	MS, Environmental Sciences (Geochemistry) BS, Geology	Geohydrology and soils
Bison Engineering		
Kevin Mathews	BS, Chemical Engineering Graduate Certificate, Environmental Management	Air quality and GHG emission analysis
Grant Rodway, E.I.	BS, Environmental Engineering BA, Psychology	Air quality and GHG emission analysis
BBC Research		
Doug Jeavons	MA, Economics BA, International Affairs	Socioeconomic analysis
Janna Raley	BA, Economics	Socioeconomic analysis
Big Sky Acoustics		
Kristin Connolly	BA, Molecular, Cellular, and Developmental Biology	Public health and safety, noise
Sean Connolly	MME, Engineering BS, Mechanical Engineering	Public health and safety, noise

THIS PAGE INTENTIONALLY LEFT BLANK

References

References

Executive Summary

B

Bureau of Land Management (BLM).

1989 Amoco Carbon Dioxide Projects Final Environmental Impact Statement. Casper District, Casper, Wyoming. November 1989

1997 *Record of Decision and Green River Resource Management Plan*. Green River Resource Area. Rock Springs Field Office, Rock Springs, Wyoming.

2007 Record of Decision and Approved Casper Resource Management Plan. Casper Field Office, Casper, Wyoming.

2008a Record of Decision and Approved Pinedale Resource Management Plan. Pinedale Field Office, Pinedale, Wyoming

2008b Record of Decision and Approved Rawlins Resource Management Plan. Rawlins Field Office, Rawlins, Wyoming.

2012b *Manual 6280: Management of National Scenic and Historic Trails and Trails Under Study or Recommended as Suitable for Congressional Designation*. Washington, D.C. Available at: http://www.blm.gov/pgdata/etc/medialib/blm/wo/Information_Resources_Management/policy/blm_manual.Par.1039.File.dat/M6280%20NSHT%20Management_Final_091212%20(2).pdf

2014a *Final Scoping Report for the Draft Environmental Impact Statement for the Riley Ridge to Natrona Project*. Available at http://www.blm.gov/wy/st/en/info/NEPA/documents/rsfo/RRNP.html. High Desert District, Rock Springs, Wyoming.

2014b Record of Decision and Approved Lander Resource Management Plan. Lander Field Office, Lander, Wyoming

2015 Record of Decision and Approved Resource Management Plan Amendments for the Rocky Mountain Region including the Greater Sage-Grouse Sub-Regions of Lewistown, North Dakota; Northwest Colorado; and Wyoming and the Approved Resource Management Plans for Billings, Buffalo, Cody, HiLine, Miles City, Pompeys Pillar National Monument, South Dakota, and Worland. Washington, D.C. September 24.

F

Fremont County

2004 *Fremont County Land Use Plan*. Available at: http://fremontcountywy.org/wp-content/uploads/2010/01/Fremont-County-Land-Use-Plan.pdf.

M

Miller, J.A. and R.A. Jones

1981 A Laboratory Study to Determine Physical Characteristics of Heavy Oil after CO2 Saturation. Paper SPE 9789 presented at the 2nd Joint SPE/DOE Symposium on Enhanced Oil Recovery. Tulsa, Oklahoma. April 1981.

N

Natrona County

2014 *Natrona County 2040. An amendment to the 1998 Natrona County Development Plan*. July 2014. Available at: http://www.natrona.net/DocumentCenter/View/2332.S

S

Sublette County
2003 *Sublette County Comprehensive Plan*. Sublette County Board of Commissioners and Sublette County Planning Commission, Sublette, Wyoming
2009 *Sublette County Federal & State Land Use Policy*. Board of Commissioners, Sublette County, Wyoming. Sublette County Conservation District

Sublette County Conservation District
2014. *Sublette County Conservation District Long Range Plan 2014-2019*. Sublette County Conservation District. Pinedale, Wyoming.

Sweetwater County
2002 *Sweetwater County Comprehensive Land Use Plan*. Sweetwater County Commission, Green River, Wyoming

Sweetwater Conservation Disrict
2011 Sweetwater County Conservation District Land and Resource Use Plan and Policy. Sweetwater Conservation District. Sweetwater, Wyoming.

W

Wyoming Office of the Governor
2013 *Wyoming's Action Plan for Energy, Environment and Economy*. Office of Governor Matthew H. Mead. Available at: http://issuu.com/energy_strategy/docs/wy_energy_strategy?e=8164076/2618210.

Wyoming Office of State Lands and Investments
2013 Wyoming Office of State Lands and Investments. Available at: http://lands.wyo.gov/.

Chapter 1

B

Bureau of Land Management (BLM)
1989 Amoco Carbon Dioxide Projects Final Environmental Impact Statement. Casper District, Casper, Wyoming. November 1989
1997 *Record of Decision and Green River Resource Management Plan*. Green River Resource Area. Rock Springs Field Office, Rock Springs, Wyoming.
2005b *Land Use Planning Handbook H-1610-1*. Washington, D.C. Available at: http://www.blm.gov/style/medialib/blm/ak/aktest/planning/planning_general.Par.65225.File.dat/blm_lup_handbook.pdf
2007 Record of Decision and Approved Casper Resource Management Plan. Casper Field Office, Casper, Wyoming.
2008a *Bureau of Land Management Handbook H-1790-1: Bureau of Land Management National Environmental Policy Act*. Bureau of Land Management National Environmental Policy Act Program. Office of the Assistant Director, Renewable Resources Planning, Washington, D.C.
2008b Record of Decision and Approved Pinedale Resource Management Plan. Pinedale Field Office, Pinedale, Wyoming
2008c Record of Decision and Approved Rawlins Resource Management Plan. Rawlins Field Office, Rawlins, Wyoming.

BLM

2012a *Manual 6280: Management of National Scenic and Historic Trails and Trails Under Study or Recommended as Suitable for Congressional Designation*. Washington, D.C. Available at: http://www.blm.gov/pgdata/etc/medialib/blm/wo/Information_Resources_Management/policy/blm_manual.Par.1039.File.dat/M6280%20NSHT%20Management_Final_091212%20(2).pdf

2012b *BLM Manual 6310. Conducting Wilderness Characteristics Inventory on BLM Lands*. Available at: http://www.blm.gov/or/plans/rmpswesternoregon/files/lwci-manual.pdf

2012c *BLM Manual 6320. Considering Lands with Wilderness Characteristics in the BLM Land Use Planning Process*. Release 6-130. March 15, 2012. Available at: http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/blm_manual.Par.52465.File.dat/6320.pdf.

2014a *Final Scoping Report for the Draft Environmental Impact Statement for the Riley Ridge to Natrona Project*. High Desert District, Rock Springs, Wyoming. Available at http://www.blm.gov/wy/st/en/info/NEPA/documents/rsfo/RRNP.html.

2014b Record of Decision and Approved Lander Resource Management Plan. Lander Field Office, Lander, Wyoming

2015 Record of Decision and Approved Resource Management Plan Amendments for the Rocky Mountain Region including the Greater Sage-Grouse Sub-Regions of Lewistown, North Dakota; Northwest Colorado; and Wyoming and the Approved Resource Management Plans for Billings, Buffalo, Cody, HiLine, Miles City, Pompeys Pillar National Monument, South Dakota, and Worland. Washington, D.C. September 24.

F

Fremont County

2004 *Fremont County Land Use Plan*. Available at: http://fremontcountywy.org/wp-content/uploads/2010/01/Fremont-County-Land-Use-Plan.pdf.

M

Miller, J.A. and R.A. Jones

1981 A Laboratory Study to Determine Physical Characteristics of Heavy Oil after CO2 Saturation. Paper SPE 9789 presented at the 2nd Joint SPE/DOE Symposium on Enhanced Oil Recovery. Tulsa, Oklahoma. April 1981.

N

Natrona County

2014 *Natrona County 2040. An amendment to the 1998 Natrona County Development Plan*. July 2014. Available at: http://www.natrona.net/DocumentCenter/View/2332.

S

Sublette County

2003 *Sublette County Comprehensive Plan*. Sublette County Board of Commissioners and Sublette County Planning Commission, Sublette, Wyoming

2009 *Sublette County Federal & State Land Use Policy*. Board of Commissioners, Sublette County, Wyoming.

Sublette County Conservation District

2014. *Sublette County Conservation District Long Range Plan 2014-2019*. Sublette County Conservation District. Pinedale, Wyoming.

Sweetwater County
2002 *Sweetwater County Comprehensive Land Use Plan*. Sweetwater County Commission, Green River, Wyoming
2011 Sweetwater County Conservation District Land and Resource Use Plan and Policy. Sweetwater County Conservation District. Sweetwater County, Wyoming

W

Wyoming Office of the Governor
2013 *Wyoming's Action Plan for Energy, Environment and Economy*. Office of Governor Matthew H. Mead. Available at: http://issuu.com/energy_strategy/docs/wy_energy_strategy?e=8164076/2618210.

Wyoming Office of State Lands and Investments
2013 Wyoming Office of State Lands and Investments. Available at: http://lands.wyo.gov/.

Chapter 2

B

Bureau of Land Management (BLM)
2015 Record of Decision and Approved Resource Management Plan Amendments for the Rocky Mountain Region including the Greater Sage-Grouse Sub-Regions of Lewistown North Dakota; Northwest Colorado; Wyoming; and the Approved Resource Management Plans for Billings, Buffalo, Cody, HiLine, Miles City, Pompeys Pillar National Monument, South Dakota, Worland. Washington D.C. September 24.

Bui, T. D., J.M. Marzluff, and B. Bedrosian
2010 Common Raven Activity in Relation to Land Use in Western Wyoming: Implications for Greater Sage-Grouse Reproductive Success. Condor, 112, 65-78.

C

Connelly, John W., Michael A. Schroeder, Alan R. Sands, and Clait E. Braun
2000 Guidelines to manage sage grouse populations and their habitats. Available: http://dfw.wa.gov/publications/01115/wdfw01115.pdf

D

Denbury Green Pilpeline, Riley Ridge LLC (Denbury)
2015 Email response to Request for Information (sent by EPG) from Rusty Shaw regarding the need for more technical information to respond to BLM comment on the Draft EIS received August 2015.

H

Hagen, C. A., J.W. Connelly, and M.A. Schroeder
2007 A Meta-analysis of Greater Sage-Grouse Centrocercus urophasianus Nesting and Brood-rearing Habitats. Wildlife Biology, 13(Supplement 1), 42-50.

L

Lyon, A. G. and S.H. Anderson
2003 Potential Gas Development Impacts on Sage-Grouse Nest Initiation and Movement. Wildlife Society Bulletin, 31, 486-491.

O

Ollie, Naomi, Paul Burnett, John Kennedy, and Cody Newton
2016 *Overview of Known Cultural Resources along the Riley Ridge to Natrona Project, Wyoming*. SWCA Cultural Resource Report Number 15-198. Prepared by SWCA Environmental Consultants., Sheridan, Wyoming. Submitted to Bureau of Land Management, Rock Springs Field Office, Rock Springs. Copies available from the Division of State History, Wyoming State Historic Preservation Office, Cheyenne.

S

SWCA Environmental Consultants (SWCA)
2014 Riley Ridge to Natrona Project Plan of Development Riley Ridge Unit Development Project Sublette, Sweewater, Fremont and Natrona Counties, Wyoming.

Chapter 3

A

Adams, Richard M.
1992 Pipes and Bowls: Steatite Artifacts from Wyoming and the Region. Thesis on file at the University of Wyoming, Laramie, Wyoming.
2006 The Greater Yellowstone Ecosystem, Soapstone Bowls, and the Mountain Shoshone. *World Archaeology* 38:528–546.

Adams, Richard, Don P. Davis, and Mark E. Miller
1999 Osteometric Comparisons of Early Archaic, Protohistoric, and Modern Pronghorn: A Case for Holocene Dwarfing. In *The Trappers Point Site (48SU1006): Early Archaic Adaptations in the Upper Green River Basin, Wyoming*, edited by Mark E. Miller, Paul H. Sanders, and Julie E. Francis, pp. 278–289. Cultural Resource Series No. 1. Office of the Wyoming State Archaeologist.

Ahlbrandt, Thomas, James B. Swinehart, and David G. Maroney
1983 Dynamic Holocene Dune Fields of the Great Plains and Rocky Mountain Basins, U.S.A. In *Eolian Sediments and Processes*, edited by M. E. Brookfield and T. S. Ahlbrandt, pp. 374–406. Elsevier Scientific Publishing B. V., Amsterdam.

Ambrose, Skip and Chris Florian
2013 Sound Levels of Gas Field Activities at Greater Sage-grouse Leks, Pinedale Anticline Project Area, Wyoming, April 2013

AMEC Environment & Infrastructure, Inc.
2013 "Evaluation of Potential Sources of Low-Level Petroleum Hydrocarbon Compounds Detected in Groundwater." BLM.gov. October 2013. Accessed July 27, 2016. http://www.blm.gov/style/medialib/blm/wy/field-offices/pinedale/papadocs/water/LLPHCreport.Par.13950.File.dat/01FinalLLPHCrpt.pdf.

Armitage, C. Lawrence, Janice C. Newberry-Creasman, J. C. Mackey, Charles M. Love, J. Douglas Heffington, Kathleen Harvey, J. Elizabeth Sall, Keith Dueholm, and Steven D. Creasman
1982 *The Deadman Wash Site*. Western Wyoming College Cultural Resource Management Report No. 6.

B

Bagley, Will
2015 *South Pass Gold Rush.* Wyoming History.org, Cheyenne, Wyoming. Available at: www.wyohistory.org/encyclopedia. Accessed January 14, 2016.

Bandy, Matthew
2008 Evaluating the Importance of Research Bias in Regional Radiocarbon Datasets. Paper presented in the Archaeological Modeling Session of the 66th Annual Plains Anthropological Conference, Laramie, Wyoming.

Barrett, Hugh, Jim Cagney, Ron Clark, Jim Fogg, Karl Gebhardt, Dr. Paul L. Hanson, Brenda Mitchell, and Dan Tippy
1993 *Revised in 1995, 1998. Riparian Area Management: Process for Assessing Proper Functioning Condition*. Technical Reference 1737-9. U.S. Department of the Interior Bureau of Land Management Proper Functioning Condition Work Group.

Beauvais, Dr. Gary P. and Darby N. Dark-Smiley
2005 Species Assessment for Wyoming Pocket Gopher (*Thomomys clusius*) in Wyoming. Bureau of Land Management Wyoming State Office.

Benson, Joe
1995 *The Traveler's Guide to the Pony Express Trail*. Falcon Press Publishing, Helena, Montana.

Benton, Homer
1973 National Register of Historic Places Inventory – Nomination Form for Federal Properties for site 48SW4198. National Park Service. Available at: http://nrhp.focus.nps.gov/natreg/docs/All_Data.html.

Berry, E.W.
1942 1924. Fossil plants and unios in the Red Beds of Wyoming. The Journal of Geology 32:488-497

Binford, Lewis R.
1980 Willow Smoke and Dogs Tails: Hunter-Gatherer Settlement Systems and Archaeological Site Formation. *American Antiquity* 45(1):4–20.

Birkeland, P.W.
1999. *Soils and Geomorphology*, 3rd edition. Oxford University Press, New York, New York, and Oxford, England.

Booz Allen Hamilton
2008 Wyoming Oil and Gas Economic Contribution Study. Wyoming Heritage Foundation. August 2008. Available at: http://www.westernenergyalliance.org/sites/default/files/Wyoming%20Oil%20and%20Gas%20Economic%20Impact%20Study%20-%202008.PDF%3B.pdf.

Branch, E. Douglas
1997 *The Hunting of the Buffalo*. Reprinted. University of Nebraska Press, Lincoln. Originally published in 1929, D. Appleton and Company, New York.

Brown R.W.
1958 Fort Union Formation in the Powder River Basin, Wyoming. Wyoming Geological Association 13th Annual Field Conference Guidebook.

Buff, Carolyn M.
1983 The River Bend Site. *The Wyoming Archaeologist* 26:11–21.

Bullock, J.M.and W.H. Wilson
1969 Gypsum deposits in the Cody Area, Park County, Wyoming. The Geological Survey of Wyoming, Preliminary Report Number 9, 12 pages.

Bureau of Economic Analysis (BEA)
2003 Local Area Personal Income & Employment - Table CA25N Total full-time and part-time employment by NAICS industry. Available at: http://www.bea.gov/regional/index.htm/. Accessed: June 6, 2015.
2013a Local Area Personal Income & Employment - Table CA25N Total full-time and part-time employment by NAICS industry. Available at: http://www.bea.gov/regional/index.htm/. Accessed: June 6, 2015.
2013b Local Area Personal Income & Employment - Table CA05N Personal income by major source and earnings by NAICS industry. Available at: http://www.bea.gov/regional/index.htm/. Accessed: June 6, 2015.
2013c Local Area Personal Income & Employment – Table Compensation of employees by NAICS Industry. Available at: http://www.bea.gov/regional/index.htm/. Accessed: June 6, 2015.
2013d Local Area Personal Income & Employment - Table CA30 Economic Profile. Available at: http://www.bea.gov/regional/index.htm/. Accessed: June 6, 2015.

Bureau of Labor Statistics (BLS)
2000 Labor Force Data by County, 2000 Annual Averages. Available at: http://www.bls.gov/lau/#tables. Accessed: March 10, 2016.
2014 Labor Force Data by County, 2014 Annual Averages. Available at: http://www.bls.gov/lau/#tables. Accessed: March 10, 2016.

Bureau of Land Management (BLM)
1986a *BLM Manual H-8410-1: Visual Resource Inventory*. Available at: http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/blm_handbook.Par.31679.File.dat/H-8410.pdf.
1986b *BLM Manual 8431: Visual Resource Contrast Rating*. Available at: http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/blm_handbook.Par.79462.File.dat/8431.pdf.
1987 Pinedale Resource Management Plan Draft Environmental Impact Statement. Pinedale Field Office, Pinedale, Wyoming.
1997 *Record of Decision and Green River Resource Management Plan*. Green River Resource Area. Rock Springs Field Office, Rock Springs, Wyoming.
2003a *Guidelines for Identifying Cultural Resources.* Bureau of Land Management, Montana, North Dakota, and South Dakota Handbook H-8110-1, May 2003. U.S. Department of the Interior, Bureau of Land Management.
2003b Visual Resource Inventory. Casper Field Office, Wyoming. March 3, 2003.
2004a Jack Morrow Hills Coordinated Activity Plan/Proposed Green River Resource Management Plan Amendment: Final Environmental Impact Statement; Volume 1 of 2. U.S. Department of the Interior, Bureau of Land Management, Wyoming State Office and Rock Springs Field Office.
2004b Proposed Revisions to Grazing Regulations for the Public Lands: Final Environmental Impact Statement. Technical Reference FES 04-39. Department of the Interior, Bureau of Land Management.
2005 *Land Use Planning Handbook H-1601-1*. U.S. Department of the Interior, Bureau of Land Management. Available at: http://www.blm.gov/pgdata/etc/medialib/blm/ak/aktest/planning/planning_general.Par.65225.File.dat/blm_lup_handbook.pdf. Accessed: December 1, 2012.

BLM

2006 *Record of Decision and Jack Morrow Hills Coordinated Activity Plan/Green River Resource Management Plan Amendment*. July 2006. Available at: http://www.blm.gov/style/medialib/blm/wy/field-offices/rock_springs/jmhcap/rod.Par.9393.File.dat/00rod_cap.pdf. Accessed: September 15, 2015.

2007a Proposed Resource Management Plan and FINAL Environmental Impact Statement for the Casper Field Office Planning Area. BLM/WY/PL-07/017+1610. Bureau of Land Management.

2007b Record of Decision and Approved Casper Resource Management Plan. Casper Field Office, Casper, Wyoming.

2007d *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development.* 34 BLM/WO/ST-06/021+3071/REV 07. Denver, Colorado. Available at: http://www.blm.gov/style/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/energy/oil_and_gas.Par.18714.File.dat/OILgas.pdf

2008a *Bureau of Land Management Handbook H-1790-1: Bureau of Land Management National Environmental Policy Act*. Bureau of Land Management National Environmental Policy Act Program. Office of the Assistant Director, Renewable Resources Planning, Washington, D.C.

2008b Record of Decision and Approved Pinedale Resource Management Plan. Pinedale Field Office. Department of the Interior, 2008.

2008c *Record of Decision and Approved Rawlins Resource Management Plan.* BLM Rawlins Field Office. Department of the Interior, 2008.

2009a *BLM Handbook-8270 -1– General Procedural Guidance for Paleontological Resource Management*. Available at: http://www.blm.gov/style/medialib/blm/ut/natural_resources/cultural/paleo/Paleontology_Documents.Par.64888.File.dat/8270_hbk.pdf.

2009b *Record of Decision and Approved Butte Resource Management Plan*. Butte Field Office. Department of the Interior, 2009.

2010a GIS data file: WyCompressorPumpStations.shp. Casper Field Office, Casper, Wyoming.

2010b Oregon-California-Mormon Pioneer-Pony Express Trails. Available at: http://www.blm.gov/wy/st/en/programs/nlcs/Historic_Trails/map/trails.html. Accessed: June 23, 2015.

2011a *BLM Manual 8320 Planning for Recreation and Visitor Services*. Available at http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/blm_manual.Par.82237.File.dat/8320.pdf

2011b *BLM Manual 9113: Roads Manual (Public)*. Bureau of Land Management Manual Transmittal Sheet. Released October 21, 2011, Washington, D.C.

2011c Visual Resource Inventory. Rawlins Field Office, Wyoming. February 2011.

2011d Visual Resource Inventory. Rock Springs Field Office, Wyoming. February 2011.

2012a *Manual 6280: Management of National Scenic and Historic Trails and Trails Under Study or Recommended as Suitable for Congressional Designation*. Washington, D.C. Available at: http://www.blm.gov/pgdata/etc/medialib/blm/wo/Information_Resources_Management/policy/blm_manual.Par.1039.File.dat/M6280%20NSHT%20Management_Final_091212%20(2).pdf

2012b *BLM Manual 6310. Conducting Wilderness Characteristics Inventory on BLM Lands*. Available at: http://www.blm.gov/or/plans/rmpswesternoregon/files/lwci-manual.pdf

2012c *BLM Manual 6320. Considering Lands with Wilderness Characteristics in the BLM Land Use Planning Process*. Release 6-130. March 15, 2012. Available at: http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/blm_manual.Par.52465.File.dat/6320.pdf.

BLM

2012d Greater Uinta Basin Oil and Gas Cumulative Impacts Technical Support Document. March 2012. Vernal Field Office, Vernal, Utah.

2012e *National Historic Trails Inventory Project: Arizona, California, Colorado, New Mexico, Nevada, Utah and Wyoming*. Bureau of Land Management National Historic Trails Inventory Project, Utah Final Administrative Record, National Historic Trails Final Summary Report. U.S. Department of the Interior, Bureau of Land Management National Operation Center, Boulder.

2012f Visual Resource Inventory. Lander Field Office, Lander, Wyoming.

2013a Alkali Basin/East Sand Dunes Wilderness Study Area. U.S. Department of the Interior, Bureau of Land Management. Available at: http://www.blm.gov/wy/st/en/programs/nlcs/wsa/hdd/alkalibasin-eastdunes.print.html Accessed: July 17, 2015.

2013b *Environmental Assessment for Killpecker Sand Dunes Recreation Site Facility Improvement*. Rock Springs Field Office, Wyoming. March 2013. Available at: http://www.blm.gov/style/medialib/blm/wy/information/NEPA/rsfodocs/killpecker_sand_dunes.Par.33776.File.dat/EA.pdf

2013c GIS data file: Jurisdiction_WY_Proj_Area.shp

2013d Great Divide Herd Management Area. U.S. Department of the Interior, Bureau of Land Management. Available at: http://www.blm.gov/wy/st/en/field_offices/Lander/wh.htmlhttp://www.blm.gov/wy/st/en/field_offices/Rock_Springs/wildhorses/grtdiv.html Accessed: July 13, 2015.

2013e Green Mountain/Antelope Hills Herd Management Area. U.S. Department of the Interior, Bureau of Land Management. Available at: http://www.blm.gov/wy/st/en/field_offices/Rock_Springs/wildhorses/grtdiv.html Accessed: July 13, 2015.

2013f Little Colorado Herd Management Area. U.S. Department of the Interior, Bureau of Land Management. Available at: http://www.blm.gov/wy/st/en/field_offices/Rock_Springs/wildhorses/litcolo.html Accessed: July 13, 2015.

2013g Lost Creek Herd Management Area. U.S. Department of the Interior, Bureau of Land Management. Available at: http://www.blm.gov/wy/st/en/programs/Wild_Horses/hma/lostcreek.html. Accessed: July 13, 2015.

2013h Muskrat Basin Herd Management Area. U.S. Department of the Interior, Bureau of Land Management. Available at: https://www.blm.gov/adoptahorse/herdareas.php?herd_areas_seq=108&herd_states_seq=9. Accessed: July 13, 2015.

2013i *Scenic Quality Inventory*. Document number 5.F.12.2. Pinedale Field Office, Pinedale, Wyoming. November 2013. Received by email: June 25, 2015.

2013j What is an ACEC? Electronic document, Available at: http://www.blm.gov/co/st/en/BLM_Programs/areas_of_critical/about_acec/acec___flpma.html. Accessed: June 17, 2015.

2013k White Mountain Herd Management Area. U.S. Department of the Interior, Bureau of Land Management. Available at: http://www.blm.gov/wy/st/en/field_offices/Rock_Springs/wildhorses/whitemtn.html Accessed: July 13, 2015.

2014a Continental Divide-Creston Natural Gas Project Draft Environmental Impact Statement. December 2012. Available at: http://www.blm.gov/wy/st/en/info/NEPA/documents/rfo/cd_creston.html.

2014b Normally Pressured Lance Oil and Gas Development Project Draft Environmental Impact Statement. Pinedale and Rock Springs Field Offices, Wyoming.

2014c Record of Decision and Approved Resource Management Plan for the Lander Field Office Planning Area. Lander Field Office, Lander, Wyoming.

BLM
2015a Record of Decision and Approved Resource Management Plan Amendments for the Rocky Mountain Region including the Greater Sage-Grouse Sub-Regions of Lewistown, North Dakota; Northwest Colorado; and Wyoming and the Approved Resource Management Plans for Billings, Buffalo, Cody, HiLine, Miles City, Pompeys Pillar National Monument, South Dakota and Worland. Washington D.C. September 24.
2015b Sheep Mountain Uranium Project EIS. January 2015. Available at: http://www.blm.gov/wy/st/en/info/NEPA/documents/lfo/sheepmtn.html.

Bureau of Land Management (BLM) and U.S. Forest Service (USFS)
1998 *Guide to the Lander Cut-Off – 1857 – Oregon Trail*. Document 23.05.405.01/68, Government Printing Office, Washington, D.C. Buseck, Rebecca and Douglas A. Keinath

Buseck, Rebecca, and Douglas A. Keinath
2004 Species Assessment for Western Long-eared Myotis (*Myotis evotis*) in Wyoming. Bureau of Land Management Wyoming State Office.

Buseck, Rebecca, Douglas A. Keinath, and Matthew McGee
2004 Species Assessment for Sage Thrasher (*Oreoscoptes montanus*) in Wyoming. Bureau of Land Management Wyoming State Office.

Burnett, Paul, John Kennedy, Alex Wesson, Scott Phillips, Chris Millington, Michael Retter, Karen Reed, and Scott Slessman
2010 *Class III Cultural Resources Inventory of the Jonah 3-D Geophysical Exploration Project, Sublette County, Wyoming: Introduction*. Unpublished report submitted to the Bureau of Land Management, Pinedale Field Office, by SWCA Environmental Consultants.

Byers, David A., and Craig S. Smith
2007 Ecosystem Controls and the Archaeofaunal Record: An Example from the Wyoming Basin, USA. *Holocene* 17:1171–1183.

C

Cannon, Michael D., and David J. Meltzer.
2004 Early Paleoindian Foraging: Examining the Faunal Evidence for Large Mammal Specialization and Regional Variability in Prey Choice. *Quaternary Science Reviews* 23:1955–1987.

Cannon, Kenneth P., Molly Boeka Cannon, and Jon Peart
2015 Prehistoric Bison in Jackson Hole, Wyoming: New Evidence from the Goetz Site (48TE455). In *Rocky Mountain Archaeology: A Tribute to James Benedict*, edited by Kenneth P. Cannon, Judson Byrd Finley, and Molly Boeka Cannon, pp. 392–419. *Plains Anthropologist* Memoir 43. Hanover, Pennsylvania.

Centers for Disease Control and Prevention (CDC)
n.d. Chemical Listing and Documentation of Revised IDLH Values. The National Institute for Occupational Safety and Health. Available at: http://www.cdc.gov/niosh/idlh/intridl4.html. Accessed: July 15, 2015.

City of Green River
n.d. The Trona Industry in Sweetwater County. Green River, Wyoming. Available at: http://www.cityofgreenriver.org/index.aspx?NID=246. Accessed: June 2015.

City of Lander
n.d. Lander, Wyoming. Available at: http://landerwyoming.org. Accessed on June 2015.

City of Riverton
2009 *Riverton Master Plan, Looking to the Future*. Riverton, Wyoming. Available at http://www.rivertonwy.gov/departments/community_development/docs/MasterPlan/Riverton_plan_adopted4_7_09.pdf.

Clarey, K.E., T. Bartos, D. Copeland, L.L. Hallburg, M.L. Clark, and M.L. Thomson.
2010 Available Groundwater Determination, Technical Memorandum, WWDC Green River Basin Water Plan II – Groundwater Study Level 1 (2007-2009). Wyoming Water Development Commission. August.

Cobban, W.A.
1952 A new upper Cretaceous ammonite genus from Wyoming and Utah. Journal of Paleontology 26(5):758-760.

Commission for Environmental Cooperation
2011 *North American Terrestrial Ecoregions – Level III*. Commission for Environmental Cooperation.

Conservation Fund
2015 Fish Creek Flying W Ranches. The Conservation Fund. Available at: http://www.conservationfund.org/projects/fish-creek-flying-w-ranches. Accessed: July 16, 2015.

Cope, E.D
1884. Vertebrata of the Tertiary Formations of the west. Report of the U.S. Geological Survey of the Territories, vol. 3.

Copeland, H., S. Tessmann, M. Hogan, S. Jester, A. Orabona,, S. Patla and K. Sambor, J. Kiesecker
2010 Wyoming Wetlands: Conservation Priorities and Strategies. Lander, Wyoming: The Nature Conservancy.

Council on Environmental Quality (CEQ)
1997 Environmental Justice. Guidance Under the National Environmental Policy Act. December 1997. Available at https://www.epa.gov/sites/production/files/2015-02/documents/ej_guidance_nepa_ceq1297.pdf Accessed on March 11, 2016.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe
1979 *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-79/31. Department of Interior, Fish and Wildlife Service, Washington, D.C.

Creasman, Steven D.
1987 The Altithermal: Paleoenvironmental Reconstruction and Subsistence Change in Southwestern Wyoming. In *Perspectives on Archaeological Resources Management in the Great Plains*, edited by A. J. Osborn and R. C. Hassler, pp. 283–297. I and O Publishing, Omaha, Nebraska.

Creasman, Steven D., Ted Hoefer, III, Janice C. Newberry, Thomas R. Reust, Douglas Kullen, and H. R. Davidson
1983 Archaeological Monitor and Salvage Excavations along the Trailblazer Pipeline, Southern Wyoming. Archaeological Services of Western Wyoming College, Rock Springs. Report No. 10.

D

Dale, Harrison Clifford
1991 *The Explorations of William H. Ashley and Jedediah Smith, 1822-1829*. Reprinted. University of Nebraska Press, Lincoln. Originally published 1941, Arthur H. Clark Company, Glendale, California.

Dark-Smiley, Darby N. and Douglas A. Keinath
2004 Species Assessment for Long-Billed Curlew (*Numenius americanus*) in Wyoming. Bureau of Land Management Wyoming State Office.

Darlington, David G., and Ted Hoefer III
1992 *Archaeological Data Recovery Along the Western Gas Processors Lincoln Road Pipeline, Sweetwater County, Wyoming.* Cultural Resource Management Report No. 56. Archaeological Services of Western Wyoming College, Rock Springs.

Davis, Leslie B., Stephen A. Aaberg, and Sally T. Greiser
1988 Paleoindians in Transmontane Southwestern Montana: The Barton Gulch Occupations, Ruby River Drainage. *Current Research in the Pleistocene* 5:9–11.

Department of Energy (DOE) and Bureau of Land Management (BLM)
2008. *Programmatic Environmental Impact Statement, Designation of Energy Corridors on Federal Land in 11 Western States.* Prepared with U.S. Forest Service, Department of Defense, and U.S. Fish and Wildlife Service as federal cooperating agencies. DOE/EIS-0386.

DeVoto, Bernard
1947 *Across the Wide Missouri*. Houghton Mifflin Company, Boston.

Dobyns, Henry F.
1993 Disease Transfer at Contact. *Annual Review of Anthropology* 22:273–291.

Douglas, Walter B.
1964 *Manuel Lisa*. Argosy-Antiquarian, Ltd., New York.

Drean, Thomas A.
2014 *Wyoming's Oil and Gas Resources Summary Report*. Wyoming State Geological Survey. Feb. 2014. 11 June 2015.

Drucker, Sam
2006 Wardell Revisited: Floods, Looting, and the 2005 Preliminary Excavation Report. Presentation given to the Green River Valley Museum, Big Piney, Wyoming. Available at: http://www.blm.gov/wy/st/en/field_offices/Pinedale/arch.html. Accessed January 25, 2016.

Dutton , S.P.
1993 Influence of provenance and burial history on diagenesis of lower Cretaceous Frontier Formation sandstones, Green River basin, Wyoming. Journal of Sedimentary Petrology 63(4):665-677.

E

Eakin, Daniel H. (editor)
1987 Final Report of Salvage Investigations at the Split Rock Ranch Site (48FR1484). Highway Project SCPF-020-2(19), Fremont County, Wyoming. Prepared for Wyoming Highway Department.

Eakin, Daniel H. (editor)
2005 Evidence for Shoshonean Bighorn Sheep Trapping and Early Historic Occupation in the Absaroka Mountains of Northwest Wyoming. In *University of Wyoming/National Park Service Research Center 29th Annual Report*, edited by Henry J. Harlow, pp. 74–86. University of Wyoming Graphic Arts and Publications, Laramie.

Eckerle, William P.
1997 Eolian Geoarchaeology of the Wyoming Basin: Changing Environments and Archaic Subsistence Strategies in the Holocene. In *Changing Perspectives of the Archaic on the Northwestern Plains and Rocky Mountains*, edited by M. L. Larson and J. E. Francis, pp. 138–167. University of South Dakota Press, Vermillion.

Eckerle, William P., and J. Hobey
1993 *Geoarchaeological Assessment of Site 48SW1560, Sweetwater County, Wyoming*. William Eckerle, Consulting Geoarchaeologist. Submitted to Archaeological Services of Western Wyoming Community College. Copies available from Archaeological Services of Western Wyoming Community College, Rock Springs.

Eckles, David, Jeffery Lockwood, Rabinder Kumar, Dale Wedel, and Danny N. Walker
1994 An Early Historic Period Horse Skeleton From Southwestern Wyoming. *The Wyoming Archaeologist* 38(3-4):55–68.

Eddy, Frank
1982 The Archaeological Mitigation Program and Excavations at Site 5MF605, Browns Park National Wildlife Refuge, Moffat County, Colorado. Prepared for U.S. Department of the Interior National Park Service, Rocky Mountain Regional Office Interagency Archaeological Services Branch.

Eicher, D.L.
1960 Stratigraphy and micropaleontology of the Thermopolis Shale. Peabody Museum of Natural History Bulletin 15, 126 pages and 6 plates.

Elzanowski, A., G.S. Paul, and T.A. Stidham
2000 An avian quadrate from the late Cretaceous Lance Formation of Wyoming. Journal of Vertebrate Paleontology 20(4):712-719.

Emry, R.J.
1975 Revised Tertiary stratigraphy and paleontology of the Western Beaver Divide, Fremont County, Wyoming. *Smithsonian Contributions to Paleobiology*, Number 26.

Emry, R.J. and W.W. Korth
2012 Early Chadronian (late Eocene) rodents from the Flagstaff Rim Area, central Wyoming. Journal of Vertebrate Paleontology 32(2):419-432.

Environmental Protection Agency (EPA)
1978 Protective Noise Levels, Condensed Version of EPA Levels Document. EPA 550/9-79-100 (N-96-01 II-A-86)
2007 Water Quality Rules and Regulations – Chapter 1, Wyoming Surface Water Quality Standard. Available at: http://www.epa.gov/sites/production/files/2014-12/documents/wy-chapter1.pdf. Accessed on January 17, 2016.
2011 Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2009, April 15, 2011.
2015a EPA Air Data, Monitor Values Report. Available at: http://www.epa.gov/airquality/airdata/ad_rep_mon.html. Accessed: June 14, 2015.
2015b EPA Air Trends, Design Values. Available at: http://www.epa.gov/airtrends/values.html, Accessed: June 13, 2015.

EPA
2015c EPA Facility Level GHG Emissions Data. Available at: http://ghgdata.epa.gov/ghgp/main.do. Accessed: June 2015.
2015d Interactive Map. EnvironMapper. Available at: http://www.epa.gov/myem/efmap/index.html?ve=6,42.99963,-107.551452&pText=Wyoming. Accessed: July 15, 2015.
2015e National Emissions Inventory Air Pollutant Emissions Trends Data Technology Transfer Network. Available at: http://epa.gov/ttn/chei1/trends/. Accessed: July 14, 2015.
2015f 2011 National Emissions Inventory. Technology Transfer Network. Available at: http://epa.gov/ttn/cheif/net/2011inventory.html. Accessed: July 14, 2015.

Erathem-Vanir Geological Consultants
2012. Paleontological Resources Assessment Report (EVG-2012WY-232). Prepared for Denbury Onshore LLC, Plano, Texas by Erathem-Vanir Geological Consultants, Pocatello, Idaho, 157 p.

Estes, R.
1969 Relationships of two Cretaceous lizards (Sauria, Teiidae). Brevoria, Number 317.

Estes, R. and B. Sanchiz
1982 New discoglossid and palaeobatrachid frogs from the late Cretaceous of Wyoming and Montana, and a review of other frogs from the Lance and Hell Creek formations. Journal of Vertebrate Paleontology 2(1):9-20.

Ewers, John C.
1955 *The Horse in Blackfoot Indian Culture.* Bureau of American Ethnology Bulletin No. 159. Smithsonian Institution, Washington, D.C.

F

Falkingham, P.L., J. Milan, and P.L. Manning
2010 A crocodilian trace from the Lance Formation (upper Cretaceous) of Wyoming. Pp. 171-174 In Milan, J., S.G. Lucas, M.G. Lockley, and J.A. Spielmann (Eds.) Crocodyle tracks and traces. New Mexico Museum of Natural History and Science Bulletin 51.

Federal Emergency Management Agency (FEMA)
2015 Wyoming Multi Hazard Risk Assessment Database. Available at: http://fema.maps.arcgis.com/home/webmap/viewer.html?webmap=48669d5c8ef047e4be00694d5cdaccf7&extent=-115.0313,39.3708,-100.8479,46.5157. Accessed: July 15, 2015.

Federal Highway Administration (FHWA)
2014 Federal Highways Administration. National Scenic Highways Legislation. Available at http://www.fhwa.dot.gov/hep/scenic_byways/us_code.cfm.

Federal Transit Administration (FTA)
2006 Transit Noise and Vibration Impact Assessment. FTA-VA-90-1003-06

Fenneman, N.M.
1928 Physiographic Divisions of the United States. *Annals of the Association of American Geographers* 18(4):261-353.

Fenneman, N.M.
1931 *Physiography of the Western United States*. McGraw Hill Book Company Inc., New York and London.

Ferber, C.T. and N.A. Wells.
1995. Paleolimnology and taphonmy of some fish deposits in "Fossil" and "Uinta" Lakes of the Eocene Green River Formation, Utah and Wyoming. Palaeogeography, Palaeoclimatology, Palaeoecology 117 (3-4):185-210.

Fertig, Walter
2000a State Species Abstract Wyoming Natural Diversity Database: *Artemisia porter,* Porter's Sagebrush. Wyoming Natural Diversity Database.
2000b State Species Abstract, Wyoming Natural Diversity Database: *Cirsium aridum,* Cedar Rim Thistle. Wyoming Natural Diversity Database.
2000c State Species Abstract, Wyoming Natural Diversity Database: *Cryptantha subcapitata,* Owl Creek Miner's Candle. Wyoming Natural Diversity Database.
2000d Status Review of the Ute Ladies Tresses (*Spiranthes diluvialis*) in Wyoming. Prepared for the Wyoming Cooperative Fish and Wildlife Research Unit, U.S. Fish and Wildlife Service, and Wyoming Game and Fish Department. Wyoming Natural Diversity Database.
2002 Status of Tufted Twinpod (*Physaria condensata*) in Southwest Wyoming. Prepared for the Bureau of Land Management Wyoming State Office and Wyoming Natural Diversity Database, University of Wyoming.

Fertig, Walter, updated by Bonnie Heidel
2010 State Species Abstract, Wyoming Natural Diversity Database: *Lesquerella macrocarpa*, Large-Fruited Bladderpod. Wyoming Natural Diversity Database.

Fertig, Walter, and Laura Welp
1998 Status Report on Persistent Sepal Yellowcress (*Rorippa calycina*) in Wyoming. Prepared for the Bureau of Land Management Wyoming State Office. Wyoming Natural Diversity Database.

Fertig, Walter, and Robert Thurston
2003 Modeling the Potential Distribution of BLM Sensitive and USFWS Threatened and Endangered Plant Species in Wyoming. Prepared for the Bureau of Land Management Wyoming State Office. Wyoming Natural Diversity Database. February 17, 2003.

Field, Andy, and Alex Nitzman
2009 Wyoming Highways. AARoads.com. Available at: http://www.aaroads.com/west/wyoming.html. Accessed: March 27, 2014.

Field, R.A., and C.J. Kercher
n.d. *John Arthur Hill, 1880–1951: A Brief Biography*. Available online at the American Society of Animal Science website, http://www.asas.org/docs/publications/hillbio.pdf. Accessed: January 22, 2014.

Finley, Judson Byrd, Maureen P. Boyle, and David C. Harvey
2015 Obsidian Conveyance in the Mountain World of the Numa. In *Rocky Mountain Archaeology: A Tribute to James Benedict*, edited by Kenneth P. Cannon, Judson Byrd Finley, and Molly Boeka Cannon, pp. 375–391. *Plains Anthropologist* Memoir 43. Hanover, Pennsylvania.

Finn, T.M
2014 Lower Cody Shale (Niobrara equivalent) in the Bighorn Basin, Wyoming and Montana–Thickness, distribution, and source rock potential. U.S. Geological Survey Scientific Investigations Report 2013-5138, 32 pages.

Foster, J.R.
2001 Salamander tracks (*Ambystomichnus?*) from the Cathedral Bluffs Tongue of the Wasatch Formation (Eocene), southwestern Wyoming. Geological Society of America, Rocky Mountain Section, 52nd Annual Meeting, Missoula, MT, United States, April 17-18, 2000, 32(5)8-9.

Foster, J.R.
2003 Paleoecological analysis of the vertebrate fauna of the Morrison Formation (upper Jurassic), Rocky Mountain Region, U.S.A. New Mexico Museum of natural History and Science Bulletin 23, 95 pages.

Francis, Julie E.
1994 *Root Procurement in the Upper Green River Basin, Wyoming: Data Recovery at 48SU1002*. The Office of the Wyoming State Archaeologist, Laramie. Prepared for the Wyoming Department of Transportation, Cheyenne.

Frazer, Robert W.
1972 Forts of the West: Military Forts and Presidios and Posts Commonly Called Forts West of the Mississippi River to 1898. University of Oklahoma Press, Norman.

Fremont County
n.d. Fremont County Weed and Pest. Available at: www.fcwp.org.
2004 *Fremont County Land Use Plan*. Available at: http://fremontcountywy.org/wp-content/uploads/2010/01/Fremont-County-Land-Use-Plan.pdf.

Friedman, Paul D.
1988 *An Historical Study of the Richardson Pit Site, Riverton, Wyoming.* Archaeology Department, Powers Elevation Company, Inc. Submitted to Wyoming State Highway Department.

Frison, George C.
1970 The Glenrock Buffalo Jump, 48CO304: Late Prehistoric Period Buffalo Procurement and Butchering on the Northwestern Plains. *Plains Anthropologist* Memoir No. 7 15(50).
1971 Shoshonean Antelope Procurement in the Upper Green River Basin, Wyoming. *Plains Anthropologist* 16:258–284.
1973 *The Wardell Buffalo Trap 48SU301: Communal Procurement in the Upper Green River Basin, Wyoming*. Anthropological Papers, No. 48. Museum of Anthropology, University of Michigan, Ann Arbor.
1976 The Chronology of Paleo-Indian and Altithermal Period Groups in the Big Horn Basin, Wyoming. In *Cultural Change and Continuity: Essays in Honor of James Bennet Griffin,* edited by Charles E. Cleland, pp. 147–173. Academic Press, New York.
1980 A Composite, Reflexed, Mountain Sheep Horn Bow from Western Wyoming. *Plains Anthropologist* 25:173–175.
1982 Sources of Steatite and Methods of Prehistoric Procurement and Use in Wyoming. *Plains Anthropologist* 27:273–286.
1983 The Lookingbill Site, Wyoming 48FR308. *Tebiwa* 20:1–16.
1991 *Prehistoric Hunters of the High Plains*, 2nd edition. Academic Press, New York.
1992 The Foothills-Mountain and Open Plains: The Dichotomy in Paleoindian Subsistence Strategies Between Two Ecosystems. In *Ice Age Hunters of the Rockies,* edited by D. J. Stanford and J. S. Day, pp. 323–342. Denver Museum of Natural History and University Press of Colorado, Niwot.

Frison, George C.
1997 The Foothill-Mountain Late Paleoindian and Early Plains Archaic Chronology and Subsistence. In *Changing Perspectives of the Archaic on the Northwest Plains and Rocky Mountains,* edited by M. L. Larson and J. L. Francis, pp. 85–104. University of South Dakota Press, Vermillion.

Frison, George C., and Danny N. Walker
1984 The Dead Indian Creek Site: An Archaic Occupation in the Absaroka Mountains of Northwest Wyoming. *The Wyoming Archaeologist* 27:11–122.
2007 *Medicine Lodge Creek Site*. Clovis Press, Avondale, Colorado.

Frison, George C., Michael Wilson, and Danny N. Walker
1978 The Big Goose Creek Site: Bison Procurement and Faunal Analysis. *Occasional Papers on Wyoming Archeology* No. 1.

Frison, George C., Rhonda L. Andrews, James M. Adovasio, Ronald C. Carlisle, and Robert Edgar
1986 A Late Paleoindian Animal Trapping Net from Northern Wyoming. *American Antiquity* 51:352–361.

Frost, Ned M.
1973 National Register of Historic Places Inventory – Nomination Form for Federal Properties for the Briger Immigrant Road – Waltman Crossing. National Park Service. Available at: http://nrhp.focus.nps.gov/natreg/docs/All_Data.html.

G

Gardner, Dudley
1982 *Historic Overview of the Lander to Rock Springs Stage Line*. Report on file at Archaeological Services of Western Wyoming College, Rock Springs, Wyoming

Gardner, J.D.
1999. Comments on amphibians from the Green River Formation with a description of a fossil tadpole. Vertebrate paleontology in Utah. Miscellaneous Publication, Utah Geological Survey 99-1:455-461.

General Land Office (GLO)
1901 [Map for T. 23N., R. 108W.] Available at the Bureau of Land Management, Wyoming.

Gill, George W.
1991 Human Skeletal Remains on the Northwestern Plains. In *Prehistoric Hunters of the High Plains*, edited by G. C. Frison, pp. 431–447. 2nd ed. Academic Press, New York.

Gilmore, C.W.
1931 A new species of Troodont dinosaur from the Lance Formation of Wyoming. Proceedings U.S. National Museum 79(9):6 pages, 5 plates.

Gingerich, P.D. and J.A. Dorr, Jr.
1979 Mandible of *Chiromyoides minor* (Mammalia, Primates) from the upper Paleocene Chappo Member of the Wasatch Formation, Wyoming. Journal of Paleontology 53(3):550-552.

Glover, K.C., D.L. Naftz, and L.J. Martin
1998 Geohydrology of Tertiary rocks in the Upper Colorado River Basin, Colorado, Utah, and Wyoming, excluding the San Juan Basin: U.S. Geological Survey Water-Resources Investigations Report 96-4105, 103 p.

Grande, L.
1984 Paleontology of the Green River Formation, with a review of the fish fauna; second edition. Bulletin-Geological Survey of Wyoming 63:333.

Graff, Trevor
2014 A Rare Company: Simplot's Plans for a $300 Million Ammonia Plant. *Casper Star-Tribune*. September 30, 2014. Available at: http://trib.com/business/energy/a-rare-company-simplot-s-plans-for-a-million-ammonia/article_8aecc26e-63cc-52f1-90a0-7dead15c77e5.html. Accessed: June 2015.

Grande, L.
1984 Paleontology of the Green River Formation, with a review of the fish fauna. The Geological Survey of Wyoming Bulletin 63, 333 pages.

Gray, John S.
1977 *Blazing the Bridger and Bozeman Trails*. Annals of Wyoming, 49 (Spring 1977), p. 23-51.

Green, G.N. and P.H. Drouillard
1994 The digital geologic map of Wyoming in Arc/INFO format. U.S. Geological Survey, Open-File Report OF-94-425, scale 1:500,000.

Gruver, Jeffery C. and Douglas A. Keinath
2003 Species Assessment for Townsend's Big-Eared Bat (*Corynorhinus* [=*Plecotus*] *townsendii*) in Wyoming. Bureau of Land Management Wyoming State Office.

Gunnell, G.F.
1994 Paleocene mammals and faunal analysis of the Chappo type locality (Tiffanian), Green River Basin, Wyoming. Journal of Vertebrate Paleontology 14(1):81-104.

Gunnell, G.F. and W.S. Bartels.
1994 Early Bridgerian (middle Eocene) vertebrate paleontology and palaeoecology of the southern Green River Basin, Wyoming. Contributions to Geology, University of Wyoming 30(1):57-70.

H

Haines, Francis
1938 Where Did the Plains Indians Get Their Horses? *American Anthropologist* 40(1):112–117.

Hakiel, Bridget, Nicholas Hakiel, James C. Mackey, Thomas Reust, and Ricky Laurent
1987 The Archery Site (48SW5222): A Uinta Fremont Campsite in Southwestern Wyoming. *Southwestern Lore* 53(2):1–22.

Hämäläinen, Pekka
1998 The Western Comanche Trade Center: Rethinking the Plains Indian Trade System. *Western Historical Quarterly* 29(4):485–513.

Hansley, Paula L. and Dr. Gary P. Beauvais
2004a Species Assessment for Brewer's Sparrow (*Spizella breweri*) in Wyoming. Bureau of Land Management Wyoming State Office.
2004b Species Assessment for Sage Sparrow (*Amphispiza belli*) in Wyoming. Bureau of Land Management Wyoming State Office.

Harris, C. (editor)
1998 Handbook of Acoustical Measurements and Noise Control. Acoustical Society of America

Harrell, Lynn L., and Scott T. McKern
1986 *Maxon Ranch: Archaic and Late Prehistoric Habitation in Southwest Wyoming*. In Cultural Resource Management Report No. 18. Archaeological Services of Western Wyoming College, Rock Springs.

Harris, C. (editor)
1998 Handbook of Acoustical Measurements and Noise Control. Acoustical Society of America.

Heidel, Bonnie
2003 Prepared for the Bureau of Land Management Wyoming State Office: Status of Trelease's racemose milkvetch (*Astragalus racemosus* Pursh var. *treleasei* Porter) in Wyoming. Wyoming Natural Diversity Database.
2009 Prepared for the Bureau of Land Management Rawlins Field Office and Wyoming State Office: Status of *Astragalus diversifolius* (Meadow milkvetch) in South-Central Wyoming. Wyoming Natural Diversity Database.

Heidel, Bonnie
2012 Status of *Penstemon haydenii* (Blowout Penstemon) in Wyoming. Prepared for the Bureau of Land Management Rawlins and Rock Springs Field Offices and Wyoming State Office. Wyoming Natural Diversity Database University of Wyoming, Laramie, Wyoming. May 2012.
2014 Prepared for the Bureau of Land Management – State Office, Lander and Worland Field Offices: Status of *Phsaria saximontana* var. *saximontana* (Rocky Mountain Twinpod) in Central Wyoming, Fremont, Hot Springs, and Park Counties. Wyoming Natural Diversity Database.

Hoefer, Ted, III
1987 *Porter Hollow*. Cultural Resource Management Report No. 21. Archaeological Services of Western Wyoming College, Rock Springs.

HKM Engineering, Inc.
2002 Powder/Tongue River Basin Plan Final Report. Wyoming Water Development Commission Basin Planning Program. February.

Hoefer, Ted, III, Steven D. Creasman, D. Murcray, and J. Bozovich
1992 The South Baxter Brush Shelter Site: An Early Shoshonean Occupation in Southwestern Wyoming. *The Wyoming Archaeologist* 36(3–4):47–71.

Holmer, Richard N.
1986 Common Projectile Points of the Intermountain West. In *Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings*, edited by C. Condie and D. Fowler, pp. 89–115. University of Utah Anthropological Papers. University of Utah Press, Salt Lake City.

Homer, C., J. Dewitz, J. Fry, M. Coan, N. Hossain, C. Larson, N. Herold, A. McKerrow, J.N. VanDriel, and J. Wickham
2007 Completion of the 2001 National Land Cover Database for the Conterminous United States. Photogrammetric Engineering and Remote Sensing, Vol. 73, No. 4, pp 337-341.

Honey, J.G. and G.A. Izett
1988 Paleontology, taphonomy, and stratigraphy of the Browns Park Formation (Oligocene and Miocene) near Maybell, Moffat County, Colorado. U.S.G.S. Professional Paper 1358, 52 pages.

Honey, J.G., H.W. Roehler, J.H. Hanley, and J.G. Honey
1988. A mammalian fauna from the base of the Eocene Cathedral Bluffs Tongue of the Wasatch Formation, Cottonwood Creek Area, southeast Washakie Basin, Wyoming. *In* Geology and palaeoecology of the Cottonwood Creek delta in the Eocene Tipton Tongue of the Green River Formation and a mammalian fauna from the Eocene Cathedral Bluffs Tongue of the Wasatch Formation, southeast Wahsakie Basin, Wyoming. U.S.G. Bulletin B 1669 A-C, p. C1-C14.

Husted, W.M.
1969 *Bighorn Canyon Archaeology*. Smithsonian Institution River Basin Surveys, Publications in Salvage Archaeology No 12.

Husted, Wilfred M., and Robert Edgar
2002 *The Archaeology of Mummy Cave, Wyoming: An Introduction to Shoshonean Prehistory*. National Park Service, Midwest Archaeological Center, Lincoln, Nebraska.

Huston, Hayden H.
2000 The Road to Daniel. In *Daniel, Wyoming, The First Hundred Years: 1900-2000*, Books One and Two, edited by Hayden H. Huston, pp. 7–11. Daniel Community Center, Daniel.
.

Hutchinson, D.J., and L.R. Jones (editors)
1993 Emigrant Trails of Southern Idaho. Adventures in the Past - Idaho Cultural Resources Series, Number 1. Joint publication of USDOI Bureau of Land Management and Idaho State Historical Society.

I

Ikejiri, T., P.S. Watkins, and D.J. Gray
2006 Stratigraphy, sedimentology, and taphonomy of a sauropod quarry from the upper Morrison Formation of Thermopolis, central Wyoming. Pp. 39-46 In Foster, J.R. and S.G. (Eds.) Paleontology and geology of the upper Jurassic Morrison Formation. New Mexico Museum of Natural history and Science Bulletin 36.

Innes, Robin J.
2010 *Linanthus pungens*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available at: http://www.fs.fed.us/database/feis/. Accessed: June 11, 2015.

Intergovernmental Panel on Climate Change (IPCC)
2014 Climate Change 2014 Synthesis Report Summary for Policymakers.

Irving, Washington
2004a [1835] *Astoria*. Reprinted by Literary Classics of the United States, Inc., New York.
2004b [1837] *The Adventures of Captain Bonneville*. Reprinted by Literary Classics of the United States, Inc., New York.

Irwin, Henry T.
1971 *Late Pleistocene Inhabitants of the Plains of the United States and Canada and the American Southwest.* Unpublished Ph.D. dissertation, Department of Anthropology, Harvard University, Cambridge, Massachusetts.

J

Jablow, Joseph
1950 *The Cheyenne in Plains Indian Trade Relations 1795-1840*. Monographs of the American Ethnological Society No. 19.

Jackson, Donald, and Mary Lee Spence (editors)
1970 *The Expeditions of John Charles Frémont*, Volume 1. University of Illinois Press, Urbana.

Johnson, K.R.
1986 Paleocene bird and amphibian tracks from the Fort Union Formation, Bighorn Basin, Wyoming. Contributions to Geology, University of Wyoming 24(1):1-10.

Johnson, David E.
1998 *Reconnaissance of the Bryan to South Pass Road: Stagecoach Draw Field*. Archaeological Services of Western Wyoming College, Rock Springs, Wyoming.

Johnson, David E., and Jana V. Pastor
2003 *The Blue Point Site: Paleoindian/Archaic Transition in Southwest Wyoming.* Prepared by Western Archaeological Services, Rock Springs. Copies available from the Wyoming State Historic Preservation Office, Cheyenne.

Jouseau, Marcel R.
2012 Prepared for Western Lands Conservation Initiative, Bureau of Land Management – Rock Springs Field Office, and United States Forest Service: Status Report on *Penstemon acaulis* (Stemless Beardtongue) and *Pemstemon yampaensis* (Yampa Beardtongue) in Colorado, Utah and Wyoming. Wyoming Natural Diversity Database.

Jung, W. and J.P. Nicot
2010 Impurities in CO2-Rich Mixtures Impact v Pipeline Design: Implications for Calculating CO2 Transport Capacity. Society of Petroleum Engineers International Conference on CO2 Capture, Storage, and Utilization 10-12 November 2010, New Orleans, Louisiana.

K

Katz, S.G.
1976 Restoration of the vertebrate fossil collection of the University of Missouri at Columbia. Journal of Paleontology 50(1):194-197.

Keefer, W.R.
1970 Structural geology of the Wind River Basin, Wyoming. U.S. Geological Survey Professional Paper 495-D, 35 pages.
1972 Frontier, Cody, and Mesaverde Formations in the Wind River and Southern Bighorn Basin, Wyoming. U.S.G. Professional Paper 495-E.

Keinath, Douglas A.
2003 Species Assessment for Fringed Myotis (*Myotis thysanodes*) in Wyoming. Bureau of Land Management Wyoming State Office.
2004 Species Assessment for White-Tailed Prairie Dog (*Cynomys leucurus*) in Wyoming. Bureau of Land Management Wyoming State Office.

Keinath, D.A. and G.P. Beauvais
2006 *Wyoming Pocket Gopher (*Thomomys clusius*): a technical conservation assessment*. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/wyomingpocketgopher.pdf. Accessed: November 10, 2015.

Keinath, Douglas A. and Matthew McGee
2004 Species Assessment for Pygmy Rabbit (*Brachylagus idahoensis*) in Wyoming. Bureau of Land Management Wyoming State Office.

Keinath, Douglas A. and Catherine Schneider
2005 Species Assessment for Loggerhead Shrink *(Lanius ludovicianus)* in Wyoming. Bureau of Land Management Wyoming State Office.

Kelly, Robert L., David A. Byers, William Eckerle, Paul Goldberg, C. Vance Haynes, R. Mark Larsen, John Laughlin, Jim I. Mead, and Sage Wall
2006 Multiple Approaches to Formation Processes: The Pine Spring Site, Southwest Wyoming. *Geoarchaeology* 21:615–638.

Kelly, Robert L., and Lawrence C. Todd
1988 Coming into the Country: Early Paleoindian Hunting and Mobility. *American Antiquity* 53:231–244.

Kimball, Stanley
1994 The Mormon Trail in Utah. In *Utah History Encyclopedia*, edited by Allen Kent Powell, pp. 380–381. University of Utah Press, Salt Lake City.

Kihm, A.J.
1987. Mammalian paleontology and geology of the Yoder Member, Chadron Formation, east-central Wyoming. Dakoterra 3:25-45.

Knight, D.H.
1994 Mountains and Plains: the Ecology of Wyoming Landscapes. Yale University Press.

Knopf, F. L., R.R. Johnson, T. Rich, F.B. Samson, and R.C. Szaro
1988 Conservation of riparian ecosystems in the United States. *Wilson Bulletin* 100:272-284.

Knowlton, F.H.
1917 A fossil flora from the Frontier Formation of southwestern Wyoming. U.S. Geological Survey Professional paper 108-F, 94 pages and 39 plates.

Kochert, M. N., K. Steenhof, C.L. Mcintyre, and E.H. Craig
2002 The Birds of North America: Golden Eagle (*Aquila chrysaetos*). Cornell Lab of Ornithology. Available at: http://bna.birds.cornell.edu/bna/species/684. Accessed: June 2015.

Kornfeld, Marcel, George C. Frison, and Mary Lou Larson
2010 Prehistoric Hunter-Gatherers of the High Plains and Rockies. Left Coast Press, Walnut Creek, California.

Kornfeld, Marcel, Mary Lou Larson, and George C. Frison
2001 10,000 Years in the Middle Rocky Mountains: The Lookingbill Site. *Journal of Field Archaeology* 28:1–18.

L

Langston, E., Jr., and H. Rose
1978. A yearling crocodilian from the middle Eocene Green River Formation of Colorado. Journal of Paleontology 52(1):122-125.

Lantz, Sarah J., Hamilton Smith, and Douglas A. Keinath
2004 Species Assessment for Western Burowing Owl (*Athene cunicularia hypugaea*) in Wyoming. Prepared for Bureau of Land Management Wyoming State Office. Cheyenne, Wyoming. Available at: http://www.blm.gov/pgdata/etc/medialib/blm/wy/wildlife/animal-assessmnts.Par.52462.File.dat/WesternBurrowingOwl.pdf.

Larson, Mary Lou.
1997 "Housepits and Mobile Hunter-Gatherers: A Consideration of the Wyoming Evidence." *Plains Anthropologist* 42 (161): 353-369.

Larson, Taft Alfred
1978 *History of Wyoming.* 2nd Edition. University of Nebraska Press, Lincoln.

Lobdell, John E.
1973 Scoggin Site: An Early Middle Period Bison Kill. *The Wyoming Archaeologist* 16:1–71.

Lockley, M., K. Cart, J. Martin, and A.R.C. Milner
2011 New theropod tracksites from the upper Cretaceous "Mesaverde" Goroup, western Colorado: Implications for Ornithomimosaur track morphology. New Mexico Museum of Natural History and Science Bulletin 53:321-329.

Love, J.D.
1970 Cenozoic geology of the Granite Mountains area, central Wyoming. U.S. Geological Survey Professional Paper 495-C, 154 pages.

Lovelace, D.M., and S.D. Lovelace
2012 Paleoenvironments and paleoecology of a lower Triassic invertebrate and vertebrate Ichnoassemblage from the Red Peak Formation (Chugwater Group), central Wyoming. Palaios 27(9):636-657.

Lucas, S.G., T. Ikejiri, H. Maisch, T. Joyce, and G.L. Gianniny
2005 The mosasaur Prognathodon from the upper Cretaceous Lewis Shale near Durango, Colorado and the distribution of Prognathodon in North America. New Mexico Geological Society, 56th Field conference, Geology of Chama Basin, pages 389-394.

Lundberg, J.G., and G.R. Case
1970 A new catfish from the Eocene Green River Formation, Wyoming. Journal of Paleontology 44(3):451-457.

Lynds, R.M.
2013 Geologic storage assessment of carbon dioxide (CO_2) in the Laramide Basins of Wyoming. Wyoming State Geological Survey Technical Memorandum Number 3, 200 pages.

M

Martin, L.J.,
1996 Geohydrology of Tertiary rocks in the Green River structural basin in Wyoming, Utah, and Colorado: U.S. Geological Survey Water-Resources Investigations Report 92-4164, 43 p.

Martin, William
1999 Contributions to Archaeology. In *Archaeology along the Wyoming Segment of the Express Pipeline*, edited by William Martin and Craig Smith, pp. 4-1 through 4-21. Prepared by TRC Mariah Associates for Express Pipeline.

McDermott, John D.
2012 Dangerous Duty: A History of Frontier Forts in Fremont County, Wyoming. Fremont County Historic Preservation Commission, Wyoming.

McDonald, Kae
1993 *Archaeological Excavations at 48LN1185*. Prepared by Metcalf Archaeological Consultants, Eagle, Colorado.

McGee, E.M.
2002 Intraspecific dental variability in cf. *Coryphodon anthracoidens* (Mammalia, Pantodonta) from Roehler's *Coryphodon* Catastrophe Quarry, Washakie Basin, Wyoming. Rocky Mountain Geology 37(1):61-73.

McGrane, Reginald C.
1924 The Panic of 1837: Some Financial Problems of the Jacksonian Era. University of Chicago Press, Chicago.

McGrew, Paul O. and Thomas M. Bown
1976 "Fossil Vertebrate Faunas and Important Paleontological Sites in the Green Mountain, Ferris Seven Lakes and Sandy EIS Areas, and Sweetwater County, Wyoming." A report for the Bureau of Land Management, Contract No. YA-512-CT6-192.

McGuire, David J.
1977 *Skull Point: A Preliminary Report of 48LN317.* Occasional Paper No. 7. Archaeological Services of Western Wyoming College, Rock Springs.

McKee, Dave F.
1988 A Faunal Analysis of the River Bend Site (48NA202): Evidence of Protohistoric Subsistence on the Northwest Plains. Unpublished Master's thesis, Department of Anthropology, University of Wyoming, Laramie.

McKern, Scott T.
1988 Archaeological Investigations at the Bessie Bottom Site (48UT1186): Late Prehistoric Animal Procurement in the Upper Bear River Drainage. Cultural Resource Report No. 45. AS-WWC.

McKern, Scott T., and Steven D. Creasman
1991 *Salvage Excavations at the Vegan Site, 48LB1880: In the Green River Basin, Wyoming*. Prepared by Archaeological Services, Western Wyoming College, Rock Springs. Cultural Resource Management Report No. 58.

McKibbin, Anne, Ron J. Rood, and Michael D. Metcalf
1989 *Archaeological Excavations at Six Sites in the Leucite Hills, Sweetwater County, Wyoming*. Prepared for Black Buttes Coal Company, Point of Rocks. Report submitted to the Wyoming Bureau of Land Management, Rock Springs District, Metcalf Archaeological Consultants, Eagle, Colorado.

McNees, Lance M., Bruce McClelland, James Lowe, Jason Marmor, Ed Schneider, and Craig S. Smith
1994 Phase 2 Cultural Resource Investigations for the Northwest Pipeline Corporation Expansion II Project, Muddy Creek North and Kemmerer North Loops, Lincoln County, Wyoming. Laramie, Wyoming.

McNees, Lance, David Vlcek, and James Lowe
2006 Cultural Resources Overview of the Pinedale Field Office, Bureau of Land Management, Wyoming. Report on file at the BLM PFO, Pinedale, Wyoming.

McNees, Lance, James Lowe, Bruce McClelland, and Nathan Fleming
2010 Cultural Resources Overview of the Rawlins Field Office, Bureau of Land Management, Wyoming. Report on file at the BLM RFO, Rawlins, Wyoming.

Merchant, Carolyn
1993 *Major Problems in American Environmental History*. First Edition. D. C. Heath and Company, Lexington, Massachusetts.

Merewether, E.A. and W.A. Cobban
2007 Outcrop descriptions and fossils from the upper Cretaceous Frontier Formation, Wind River Basin and adjacent areas, Wyoming. In Wind river Basin Province Assessment Team, Petroleum Sustems and Geologica Assessment of oil and gas in Wind River basin Province, Wyoming. U.S. Geological Survey Digital Data Series DDS-69-J, chapter 11, 95 pages.

Merewether, E.A., W.A. Cobban, and R.W. Tillman
2010 Outcrops, fossils, geophysical logs, and tectonic interpretations of the upper Cretaceous Frontier Formation and contiguous strata in the Bighorn Basin, Wyoming and Montana. U.S. Geological Survey Scientific Investigations Report 2009-5256, 49 pages.

Metcalf, Michael D.
1987 Contributions to the Prehistoric Chronology of the Wyoming Basin. In *Perspectives on Archaeological Resources Management in the Great Plains*, edited by A. J. Osborn and R. C. Hassler, pp. 233–261. I & O Publishing Company, Omaha, Nebraska.

Miller, Mark E.
2012 *Military Sites in Wyoming 1700-1920.* Wyoming Department of State Parks & Cultural Resources, Cheyenne, Wyoming.

Miller, Mark E., Paul H. Sanders, and Julie E. Francis (editors)
1999 The Trappers Point Site (48SU1006): Early Archaic Adaptations in the Upper Green River Basin, Wyoming. Cultural Resource Series No. 1. Office of the Wyoming State Archaeologist.

Montgomery, G.L.
1996 Riparian areas: reservoirs of diversity. U.S. Natural Resources Conservation Service Working Paper No. 13, Northern Plains Regional Office, Lincoln, NE.

Mook, C.C.
1959. A new species of fossil crocodile of the genus *Leidyosuchus* from the Green River Beds [Wyoming]. American Museum Novitates 1933:6.

Morgan, Christopher, Ashley Losey, and Richard Adams
2012 High-Altitude Hunter-Gatherer Residential Occupations in Wyoming's Wind River Range. *North American Archaeologist* 33:35–79.

Morgan, Dale L., and Eleanor Towles Harris (editors)
1987 *The Rocky Mountain Journals of William Marshall Anderson*. Reprinted. University of Nebraska Press, Lincoln. Originally published 1967, Henry E. Huntington Library and Art Gallery, San Marino.

Moss, John H., Kirk Bryan, G. William Holmes, Linton Satterthwaite, Jr., Henry P. Hansen, C. Bertrand Schultz, and W.D. Frankforter
1951 *Early Man in the Eden Valley.* University Museum Monographs No. 6. University of Pennsylvania Museum of Archaeology and Anthropology, Philadelphia.

Moulton, Candy
1995 Roadside History of Wyoming. Mountain Press Publishing Company, Missoula,

Murphey, P.C. and D. Daitch
2007 *Paleontological Overview of Oil Shale and Tar Sands Areas in Colorado, Utah, and Wyoming*. Report prepared for the U.S. Department of the Interior, Bureau of Land Management.

Murphey, P.C. and E. Evanoff
2011 Paleontology and stratigraphy of the middle Eocene Bridger Formation, southern Green River Basin, Wyoming. Proceedings of the 9th Conference on Fossil Resources, pages 83-109.

MWH Americas, Inc., Short Elliot Hendrickson, Inc., Harvey Economics
2010 Wind-Bighorn Basin Plan Update. Wyoming Water Development Commission. Available at: http://waterplan.state.wy.us/plan/bighorn/2010/finalrept/finalrept.pdf

N

Nasatir, Abraham P.
1927 Jacques D'Eglise on the Upper Missouri, 1791-1795. *The Mississippi Valley Historical Review* 14(1):47–56.
2002 *Before Lewis and Clark: Documents Illustrating the History of the Missouri 1785-1804*. Reprinted. University of Oklahoma Press, Norman. Originally published 1952, St. Louis Historical Documents Foundation, St. Louis.

National Conservation Easement Database
2014 Cross Lazy Two Ranch 2. Available at: http://www.conservationeasement.us/projects/105457. Accessed: July 16, 2015.

National Park Service (NPS)
1995 How to Apply the National Register Criteria for Evaluation. National Park Service, Washington, D.C. Available at: http://www.nps.gov/history/nr/publications/bulletins/pdfs/nrb15.pdf. Accessed: June 25, 2015.
1999 Comprehensive Management and Use Plan Final Environmental Impact Statement: California National Historic Trail and Pony Express National Historic Trail. Management and Use Plan Update: Oregon National Historic Trail, and Mormon Pioneer National Historic Trail. U.S. Department of the Interior, National Park Service. Available at: http://www.nps.gov/cali/learn/management/upload/CALI-CMP-SM-updated.pdf. Accessed: June 15, 2015.
2014 National Register of Historic Places Program: Research. Available at: http://www.nps.gov/nr/research/index.htm. Accessed: June 25, 2015.
2015a California National Historic Trail: Stories. Available at: http://www.nps.gov/cali/learn/historyculture/stories.htm. Accessed: June 16, 2015.
2015b Mormon Pioneer National Historic Trail: History and Culture. Available at: http://www.nps.gov/mopi/learn/historyculture/index.htm. Accessed: June 15, 2015.

Natrona County
n.d Natrona County Weed and Pest. Available at: http://www.natronacountyweeds.com/.
2014 *Natrona County 2040. An amendment to the 1998 Natrona County Development Plan*. July 2014. Available at: http://www.natrona.net/DocumentCenter/View/2332.
2015 2000 Natrona County Zoning Resolution, Section 7, Nuisance Standards and Storage Requirements

Natural Resources Conservation Service (NRCS)
2016 Soil Survey data (downloaded from http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx).

NatureServe
2009 International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Database. Arlington, Virginia. Data current as of February 6, 2009.

Newton, Cody
2011 Towards a Context for Late Precontact Culture Change: Comanche Movement Prior to Eighteenth Century Spanish Documentation. *Plains Anthropologist* 56(217):53–70.
2012 Native Place, Environment, and the Trade Fort Concentration on the South Platte River, 1835-1845. *Ethnohistory* 59(2):239–260.

Noble, Ann C.
2015 "The Jonah Field and Pinedale Anticline: A Natural-gas Success Story." The Jonah Field and Pinedale Anticline: A Natural-gas Success Story. Wyoming State Historical Society, 2015. Available at: http://www.wyohistory.org/essays/jonah-field-and-pinedale-anticline-natural-gas-success-story. Accessed June 2015.

O

O'Brien, Patrick M.
1982 Archaeological Investigations at 48SW1091: A Stratified, Plant Processing Site in Southwest Wyoming. Western Wyoming College, Rock Springs.

Occupational Safety and Health Administration (OSHA)
2005 OSHA Fact Sheet, Hydrogen Suflide (H_2S) 2005.

Ollie, Naomi, Paul Burnett, John Kennedy, and Cody Newton
2016 *Overview of Known Cultural Resources along the Riley Ridge to Natrona Project, Wyoming*. SWCA Cultural Resource Report Number 15-198. Prepared by SWCA Environmental Consultants., Sheridan, Wyoming. Submitted to Bureau of Land Management, Rock Springs Field Office, Rock Springs. Copies available from the Division of State History, Wyoming State Historic Preservation Office, Cheyenne.

Omernik, J.M.
1987 Ecoregions of the conterminous United States. Map (scale 1:7,500,000). Annals of the Association of American Geographers 77(1):118-125.

Oregon State University, U.S. Department of Agriculture Forest Service, Sanborn Solutions, Inc., and University of Idaho
2008 Northwest Regional Gap Analysis Project. U.S. Geological Survey. Available at: http://gapanalysis.usgs.gov/gaplandcover/featured-post-1/. Accessed: July 2015.

P

Palmer, R. S. (editor)
1988 Palmer, R. S., ed. 1988. *Handbook of North American Birds*. Vol. 5. Yale Univ. Press, New Haven. 465 pp. quoted in NatureServe, *Aquila chrysaetos*. Available at: http://explorer.natureserve.org/servlet/NatureServe?sourceTemplate=tabular_report.wmt&loadTemplate=species_RptComprehensive.wmt&selectedReport=RptComprehensive.wmt&summaryView=tabular_report.wmt&elKey=100925&paging=home&save=true&startIndex=1&nextStartIndex=1&reset=false&offPageSelectedElKey=100925&offPageSelectedElType=species&offPageYesNo=true&post_processes=&radiobutton=radiobutton&selectedIndexes=100925. Accessed: June 2015.

Parker, Patricia and Thomas F. King
1998 *Guidelines for Evaluating and Documenting Traditional Cultural Properties*. National Register Bulletin. U.S. Department of Interior, National Park Service.

Peterson, Michael R.
2001 Folsom Mobility and Technological Organization at the Krmpotich Site: An Analysis of the Lithic Artifact Assemblage. Department of Anthropology. University of Wyoming, Laramie.

Pool, Kelly J., and C.L. Graham
2005 The Maxon Ranch and Nomad Sites: Data Recovery Excavations at Two Sites in Sweetwater County, Wyoming. Prepared by Metcalf Archaeological Consultants, Inc. for Questar Pipeline Company.

Public Lands Information Center
2015 Killpecker Sand Dunes. Exhibit. Available at: http://publiclands.org/visitorcenter/exhibits.php?e=Lands&s=Killpecker. Accessed: July 14, 2015.

R

Ramenofsky, Ann F.
1987 Vectors of Death: The Archaeology of European Contact. University of New Mexico Press, Albuquerque.

Reeside, J.B. and W.A. Cobban
1960 Studies of the Mowry Shale (Cretaceous) and contemporary formations in the United States and Canada. U.S. Geological survey Professional paper 355, 126 pages and 58 plates.

Reeves, Brian O. K.
1973 The Concept of an Altithermal Cultural Hiatus in Northern Plains Prehistory. *American Anthropologist* 75:1221–1253.

Robertson, Ronald G.
1999 Competitive Struggle: America's Western Fur Trading Posts, 1764-1865. Tamarack Books, Inc., Boise.

Robinson, P.
1966 Fossil Mammalia of the Huerfano Formation, Eocene, of Colorado. Peabody Museum of Natural History Bulletin 21, 95 pages.

Rockwell, Nicole Sauvageau, Stephanie Slaughter, and Anne McKibbin
2012 National Historic Trails Inventory: Summary of Field Inventory along the Oregon, Mormon Pioneer, California, and Pony Express Trails Corridor, in Fremont, Lincoln, Natrona, Sublette, Sweetwater, and Uinta Counties, Wyoming. Prepared by Metcalf Archaeological Consultants, Inc., Eagle and Golden, Colorado. Prepared for AECOM, Fort Collins, Colorado.

Rodland, D.L. and D.J. Bottjer
2001 Biotic recovery from the end-Permian mass extinction: Behavior of the inarticulate brachiopod Lingula as a disaster taxon. Palaios 16(1):95-101.

Roe, Frank Gilbert
1955 *The Indian and the Horse.* University of Oklahoma Press, Norman.

Roehler, H.W.
1991 Revised stratigraphic nomenclature for the Wasatch and Green river Formations of Eocene age, Wyoming, Utah, and Colorado. U.S. Geological Survey Professional Paper 1506-B.

Roehler, H.W.
1992 Description and correlation of Eocene rocks in stratigraphic reference sections for the Green River and Washakie Basins, southwestern Wyoming. U.S. Geological Survey Professional Paper 1506-D, 83 pages.
1993 Stratigraphy of the upper Cretaceous Fox Hills Sandstone and adjacent parts of the Lewis Shale and Lance Formation, east flank of the Rocks Springs Uplift, southwest Wyoming. U.S. Geological Survey, Professional Paper 1532, 57 pages.

Rollins, Philip A. (editor)
1995 *The Discovery of the Oregon Trail*. Reprinted. University of Nebraska Press, Lincoln. Originally published 1935, Charles Scribner's Sons, New York.

Rood, Ron J., and Morgan C. Pope
1993 1992 Archaeological Excavations Along the Kern River Gas Transmission Line, Southwestern Wyoming: Data Recovery at Sites 48UT1447, 48UT786, and 48UT186. Prepared by Alpine Archaeological Consultants, Montrose, Colorado. Prepared for Kern River Gas Transmission Company, Salt Lake City.

Rosenberg, Robert G.
1984 Historic Overview and Trail Evaluation for the Exxon-LaBarge Project, Lincoln and Sublette Counties, Wyoming. On file at the BLM, Kemmerer, Wyoming.

Rosenberg, Robert G.
1985 *An Historical Overview of the Opal Wagon Road*, associated with the cultural resources inventory report for the SWAB Federal 20-24 Well and Access Road. Greer Archaeological Consultants.

Rowley, P.D., W.R. Hanson, O. Tweto, and P.E. Carrara
1985 Geology map of the Vernal degree 1 x 2 degree quadrangle, Colorado, Utah, and Wyoming. U.S. Geological Survey Miscellaneous Investigations Series Map I-526.

S

Santucci, V.L. and W.P. Wall
1998 Paleontological resources at Grand Teton National Park, northwestern Wyoming. University of Wyoming National Park Service Research Center Annual Report Volume 22, Article 7:31-36.

Savage, D.E., and B.T. Waters
1978 A new omomyid from the Wasatch Formation of southern Wyoming. Folia Primatologica 30(1):1-29.

Sawyer H., M.J. Kauffman, R.M. Nielson, and J.S. Horne
2009 Identifying and Prioritizing Ungulate Migration Routes for Landscape Level Conservation. *Ecological Applications* 19:2016 – 2025.

Schmitt, L.J., Jr.
1979 Geologic map of the Crooks Peak Quadrangle, Fremont and Sweetwater counties, Wyoming. U.S. Geological Survey Geologic Quadrangle Map, GQ-1517, scale 1:24,000.

Schock, Susan, Ian Von Essen, Steven D. Creasman, Janice C. Newberry-Creasman, A., Gardner, Linda J. Scott, and Douglas Kullen
1982 Cow Hollow Creek Site: A Multi-Component Campsite in the Green River Basin, Wyoming. *Journal of Intermountain Archaeology* 1(2):100–121.

Scheiber, Laura L., and Judson B. Finley
2011 Obsidian Source Use in the Greater Yellowstone Area, Wyoming Basin, and Central Rocky Mountains. *American Antiquity* 76:372–394.

Secoy, Frank R.
1953 Changing Military Patterns of the Great Plains (17th Century through Early 19th Century). Monographs of the American Ethnological Society No. 21.pg 3-37

Sharrock, Floyd W.
1966 Prehistoric Occupation Patterns in S.W. Wyoming and Cultural Relationships with the Great Basin and Plains Areas. University of Utah, Department of Anthropology, Anthropology Papers 77.

Shields, Wayne F.
1978 *The Woodruff Bison Kill*. Anthropological Papers, Miscellaneous Paper No. 21. University of Utah, Salt Lake City, Utah

Shimkin, Demitri B.
1947 Wind River Shoshone Ethnogeography. In *Anthropological Records, Vol. 5*, pp. 245–284. University of California, Berkeley.Smith, Craig S., David A. Byers, and Cynthia D. Craven.

Smith, Craig S., David A. Byers, and Cynthia D. Craven
2008 Bison Exploration in the Wyoming Basin at the Middle/ Late Holocene Transition: A View from the Graham Ranch Site. *Plains Anthropologist* 53(207):313–332.

Smith, Craig S., and Lance M. McNees
2005 *Cymopterus bulbosus* and Prehistoric Foragers: Patch Size, Plant Density, and Return Rates. *Journal of* Ethnobiology 25(1):1–23.

Smith, Craig S., and Steven D. Creasman
1988 *The Taliaferro Site: 5000 Years of Prehistory in Southwest Wyoming*. Cultural Resource Series No. 6. Bureau of Land Management, Cheyenne, Wyoming.

Smith, Hamilton and Douglas A. Keinath
2004a Species Assessment for Mountain Plover (*Charadrius montanus*) in Wyoming. Bureau of Land Management Wyoming State Office.
2004b Species Assessment for Northern Goshawk (*Accipiter Gentiles*) in Wyoming. Bureau of Land Management Wyoming State Office.

Soister, P.W.
1967 Geology of the Puddle Sprngs Quadrangle Fremont County, Wyoming. U.S. Geological Survey Bulletin 1242-C, 36 pages.

Soister, P.E.
1968 Stratigraphy of the Wind River Formation in south-central Wind River Basin, Wyoming. U.S. Geological Survey Professional Paper 594-A, 50 pages.

Späth, Carl
1989 *Early and Middle Archaic Housepit Sites in Wyoming*. Wyoming State Historic Preservation Office, Laramie.

State of Wyoming
n.d. Title 24: Highways Wyoming State Statutes. Available at: http://legisweb.state.wy.us/statutes/statutes.aspx?file=titles/Title24/Title24.htm, accessed June 24 25, 2015.

Steele, R., S.V. Cooper, D.M. Ondov, D.W. Roberts, and R.D. Pfister
1983 Forest habitat types of eastern Idaho and western Wyoming. USDA Forest Service, General Technical Report INT-144. Intermountain Forest and Range Experiment Station, Ogden, UT. 122 p. , quoted in Burns, Russell M., and Barbara H. Honkala, tech. coords. 1990. Silvics of North America: 1. Conifers; 2. Hardwoods. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC. vol.2, 877 p. Available at: http://www.na.fs.fed.us/pubs/silvics_manual/Volume_1/pinus/flexilis.htm. Accessed: June 2015.

Stephens, J.G.
1964 Geology and uranium deposits at Crooks Gap, Fremont County, Wyoming. U.S. Geological Survey Bulletin 1147-F, 82 pages.

Steward, Julian H.
1938 *Basin-Plateau Aboriginal Sociopolitical Groups*. Bureau of American Ethnology Bulletin 120. Smithsonian Institution, Washington, D.C.

Stewart, J.D. and M. Hakel
2006 Ichthyofauna of the Mowry Shale (early Cenomanian) of Wyoming. Pp. 161-163 In Lucas, S.G. and R.M. Sullivan (Eds.) Late Cretaceous vertebrates from the Western Interior. New Mexico Museum of Natural History and Science Bulletin 35.

Stirn, Matthew
2014 Modeling Site Location Patterns Amongst Late-prehistoric Villages in the Wind River Range, Wyoming. *Journal of Archaeological Science* 41:523–532

Sublette County
2003 *Sublette County Comprehensive Plan*. Sublette County Board of Commissioners and Sublette County Planning Commission, Sublette, Wyoming
2009 *Sublette County Federal & State Land Use Policy*. Board of Commissioners, Sublette County, Wyoming.
2011 Sublette County Zoning and Development Regulations, Chapter III - Development Standards, Section 14
2014 "Your Tax Dollars at Work. A Guide to the Sublette County Budget 2014-2015." Accessed: October 2, 2014.

Sublette County Conservation District
2014 *Sublette County Conservation District Long Range Plan 2014-2019*. Sublette County Conservation District. Pinedale, Wyoming. 2014.

Sullivan, R.M.
1982 Fossil lizards from Swain Quarry: Fort Union Formation," middle Paleocene (Torrejonian), Carbon County, Wyoming. Journal of Paleontology 56(4):996-1010.

Surovell, Todd, and P. Jeffrey Brantingham
2007 A Note on the Use of Temporal Frequency Distributions in Studies of Prehistoric Demography. *Journal of Archaeological Science* 34:1868–1877.

SWCA Environmental Consultants (SWCA)
2013 GIS data files: RecreationLines.shp and RecreationSites.shp
2014a Resource Report 3 Aquatic, Vegetation, Wildlife Resources, and Wild Horses and Herd Management. August 2014.
2014b Resource Report 6 Geology. March 2014.
2014c Resource Report 8 Land Use, Livestock Grazing, Recreation, Special Designations/LWC, and Visual Resources. March 2014.
2014d Resource Report 9 Air Quality and Noise. March 2014.

Sweetwater County
2002 *Sweetwater County Comprehensive Land Use Plan*. Sweetwater County Commission, Green River, Wyoming
2014 Sweetwater County 2014 Zoning Resolution, Section 18, Nuisance Regulations

Sweetwater Conservation Disrict
2011 Sweetwater County Conservation District Land and Resource Use Plan and Policy. Sweetwater Conservation District. Sweetwater, Wyoming.

T

Taucher, P., T.T. Bartos, K. Clarey, S.A. Quillinan, L.L. Hallburg, M.L. Clark, M. Thomson, N. Gribb, B. Worman, and T. Gracias
2012 Wind/Bighorn River Basin Water Plan Update Groundwater Study Level 1 (2008-2011), Available Groundwater Determination, Technical Memorandum. Wyoming Water Development Commission. October.

Taucher, P., T.T. Bartos, K.G. Taboga, L.L. Hallburg, M.L. Clark, J. Stafford, T. Gracias, B. Hinckley, B. Worman, K. Clarey, L. Lindemann, S.A. Quillinan, D. Copeland, R. Hays, and M. Thompson.
2013 Platte River Basin Water Plan Update Groundwater Study Level 1 (2009-2013), Available Groundwater Determination, Technical Memorandum. Wyoming Water Development Commission. December.

Tesky, Julie L.
1993 *Pandion haliaetus*. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available at: http://www.fs.fed.us/database/feis/. Accessed: July 2015.

Thompson, David
1916 David Thompson's Narrative of His Explorations in Western America 1784-1812. Edited by J.B. Tyrrell. The Champlain Society, Toronto.

Thompson, Kevin W., and Jana V. Pastor
1995 *People of the Sage: 10,000 Years of Occupation in Southwest Wyoming*. Copies available from Archaeological Services Western Wyoming Community College.

Thompson, K.V., J.V. Pastor, L.W. Thompson, and W. Current
1996 *The Birch Creek Site; Fifth Millennium B.P. Habitation in Southeast Wyoming*. Cultural Resource Management Report No. 62. Archaeological Services, Western Wyoming College, Rock Springs.

Todd, Lawrence C.
2015 A Record of Overwhelming Complexity: High Elevation Archaeology in Northwestern Wyoming. In *Rocky Mountain Archaeology: A Tribute to James Benedict*, edited by Kenneth P. Cannon, Judson Byrd Finley, and Molly Boeka Cannon, pp. 355–374. *Plains Anthropologist* Memoir 43. Hanover, Pennsylvania.

Topham, Dale F.
2007 Rocky Mountain Rivalry: The Hudson's Bay Company's Involvement in the American Fur Trade Rendezvous System. *The Rocky Mountain Fur Trade Journal* 1:1–24.

TourWyoming.com
2016 Official Travel Guide Sweetwater County, Wyoming. Available at: https://www.tourwyoming.com/travel-tools/travel-guide.html. Accessed March 11, 2016.

Travsky, Amber and Dr. Gary P. Beauvais
2004 Species Assessment for the Trumpeter Swan (*Cygnus buccinators*) in Wyoming. Bureau of Land Management Wyoming State Office.
2005 Species Assessment for the Ferruginous Hawk (*Buteo regalis*) in Wyoming. Bureau of Land Management Wyoming State Office.

U

U.S. Army Corps of Engineers (USACE)
1987 Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. U.S. Army Corps of Engineers.

U.S. Census Bureau
2000 Census Available at: http://www.census.gov/main/www/cen2000.html. Accessed: June 26, 2013.
2013 American Community Survey (ACS) 2009-2013. Available at: http://www.census.gov/acs/www/. Accessed: June 02, 2015.
2014 Poverty Thresholds (2013). Available at: https://www.census.gov/hhes/www/poverty/data/threshld/. Accessed: September 8, 2015.
2015 Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2014. Available at: http://factfinder.census.gov/ Accessed: March 10, 2016.

U.S. Department of Transportation (USDOT)
1998 Traffic Noise Model (TNM) Technical Manual

U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (USDOT PHMSA)
2009 National Pipeline Mapping System Database Public Map Viewer. Available at: https://www.npms.phmsa.dot.gov/.
2014 National Pipeline Mapping System Public Map Viewer. Available at: https://www.npms.phmsa.dot.gov/

U.S. Fish and Wildlife Service (USFWS)
2006 Peregrine Falcon (*Falco peregrinus*). U.S. Fish and Wildlife Service. Available at: https://www.fws.gov/endangered/esa-library/pdf/Peregrinefactsheet.pdf.
2015a Federally Listed, Proposed and Candidate Species: Whitebark Pine (*Pinus albicaulis). U.S. Fish and Wildlife Service. Available at:* http://www.fws.gov/wyominges/Pages/Species/Species_Listed/WBP.html. Accessed: July 2015.
2015b National Wetlands Inventory: Wetlands Mapper Legend Categories. U.S. Fish and Wildlife Service. Available at: http://www.fws.gov/wetlands/data/Mapper-Wetlands-Legend.html. Accessed: June 2015.
2015c Wyoming Ecological Services, Federally Listed, Proposed and Candidate Species: Canada Lynx (*Lynx Canadensis*). U.S. Fish and Wildlife Service. Available at: http://www.fws.gov/wyominges/Pages/Species/Species_Listed/Lynx.html. Accessed: July 2015.

U.S. Forest Service (USFS)
2009 The 2009 Continental Divide National Scenic Trail Comprehensive Plan. Document Number 33 74 FR 51116.
2013 Visibility Data Summary: Bridger and Fitzpatrick Wilderness, WY. June 2013. Available at: https://www.fs.fed.us/air/documents/IMPROVE_Data_Summary_BRID1.pdf. Accessed: January 2016.

USFS

2014 Bridger Wilderness: 40 Years of Air and Water Quality Monitoring. Presented at the Wilderness 50th Anniversary Speaker Series at the Teton County Library, WY. September 2014. Available at: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3820612.pdf. Accessed: January 2016.

U.S. Geological Survey (USGS)

2004 Landslide Types and Processes. Fact Sheet 2004-3072. July 2004. Available at: https://pubs.usgs.gov/fs/2004/3072/fs-2004-3072.html. Accessed February 2017.

2015a The United States Geological Survey Water Science School: What is a Watershed? U.S. Geological Survey. Available at: http://water.usgs.gov/edu/watershed.html. Accessed: June 2015.

2015b The Water Cycle – United Sates Geological Survey Water Science School: Streamflow – The Water Cycle. U.S. Geological Survey. Available at: http://water.usgs.gov/edu/watercyclestreamflow.html. Accessed: June 2015.

2016 National Hydrography Dataset. Available at https://nhd.usgs.gov/data.html. Accessed on March 14, 2016.

University of Wyoming

2014 Improving Traveler Information on Rural Corridors in Wyoming Through the Use of Intelligent Transportation Systems. Available at: http://www.dot.state.wy.us/files/live/sites/wydot/files/shared/Planning/Research/FHWA%201403F%20RS07211%20Rural%20Travel%20Time.pdf

V

Vlcek, David T.

1999 The New Fork Wagon Road: a Nineteenth Century Southwestern Wyoming Lifeline to the Union Pacific Railspur. Paper presented at the Society for Historical Archaeology Meeting, Salt Lake City, Utah. Electronic document available online at http://www.blm.gov/wy/st/en/field_offices/Pinedale/arch/wagon_road.html. Accessed January 2009.

Visit Pinedale

2016 Pinedale, Wyoming website. Available at: http://www.visitpinedale.org. Accessed: March 10, 2016.

W

West, R.M. and M.R. Dawson.

1975. Eocene fossil Mammalia from the Sand Wash Basin, northwestern Moffat County, Colorado. Annals of Carnegie Museum 45 (Article 11): 231-253.

Western Regional Climate Center (WRCC)

2015 Monthly climate summaries accessed for Rock Springs (487845), South Pass City (488385), and Casper Natrona CO AP (481570) Wyoming. Available at: www.wrcc.dri.edu.

Wheeler, Charles W., Gail S. Firebaugh, Wm. Lane Shields, and Elisa K. Wade

1986 *5500 Years on the Great Plains - Great Basin Frontier: An Excavation of Sites in Section 14.* Prepared by Western Cultural Resource Management, Boulder, Colorado. Prepared for Exxon Company, Midland, Texas. Copies available from Office of the Wyoming State Archaeologist, Laramie.

Whitehead, R.L.
1996 Groundwater Atlas of the United States Montana, North Dakota, South Dakota, Wyoming. U.S. Geological Survey. Available at: http://pubs.usgs.gov/ha/ha730/ch_i/I-text2.html. Accessed: July 2015.

Willey, Gordan R., and Phillip Philips
1958 *Method and Theory in American Archaeology.* The University of Chicago Press, Chicago.

Williamson, T. E., S.G. Lucas, and R.K. Stucky
1996 Megalesthonyx hopsoni (Mammalia: tillodonta) from the early Bridgerian (Gardnerbuttean) of the Wind River Formation, northeastern Wind River Basin, Wyoming. Proceedings of the Denver Museum of natural History Series 3, Number 12, 3 pages.

Winward, A.H.
2000 Monitoring the vegetation resources in riparian areas. General Technical Report RMRS-GTR-47. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Wishart, David J.
1992 *The Fur Trade of the Far West 1807-1840.* Reprinted. University of Nebraska Press, Lincoln. Originally published 1979.

Wittke, Seth J.
2011 The Surficial Geologic Map of the Farson 30'X60' Quadrangle, Sweetwater, Sublette, and Fremont Counties, Wyoming. Wyoming State Geological Survey, Laramie.

Wood, W. Raymond, and Thomas D. Thiessen (editors)
1985 Early Fur Trade on the Northern Plains: Canadian Traders Among the Mandan and Hidatsa Indians, 1738-1818. University of Oklahoma Press, Norman.

WWC Engineering, Hinckley Consulting, Collins Planning Associates, Greenwood Mapping, Inc., and States West Water Resources Corporation
2007 *Wyoming Framework Water Plan Volume 1*. Wyoming Water Development Commission.

Wyoming Chapter of the Wildlife Society
2006 Appendix A: Recommended Changes to the Current Standardized Definitions for Seasonal Wildlife Ranges in the Standardized Definitions for Seasonal Wildlife Ranges. The Wildlife Society.

Wyoming Community Development Authority
2015 The 2015 Wyoming Profile of Demographics, Economics, and Housing. Volume 1. Available at: http://www.wyomingcda.com/index.php/partners/C40. Accessed: March 11, 2016.

Wyoming Department of Environmental Quality (WDEQ)
n.d. Wyoming Air Quality Monitoring Network. Available at: http://www.wybisnet.com/. Accessed: June 2015.
1997 Wyoming's Wellhead Protection (WHP) Program, Section II: Delineation of Wellhead Protection Areas (WHPAs). Wyoming Department of Environmental Quality. Available at: http://www.wrds.uwyo.edu/wrds/deq/whp/whpsect2.html. Accessed: July 2015.
2008 Interim Policy on Demonstration of Compliance with WAQSR Chapter 6, Section 2(c)(ii) for sources in Sublette County. Available at: http://sgirt.webfactional.com/filesearch/content/Air%20Quality%20Division/Programs/Ozone/Winter%20Ozone-Technical%20Documents/2008-0721_AQD_Interim-Permit-Policy-on-Demonstration-of-Compliance.pdf. Accessed: June 2015.

WDEQ

2013 Wyoming Surface Water Classification List. Available at http://sgirt.webfactional.com/filesearch/content/Water%20Quality%20Division/Programs/Watershed%20Protection/Sub/Surface%20Water%20Quality%20Standards/Guidance%20Documents/2013-0726_wqd-wpp-surface-water-standards_Wyoming-Surface-Water-Classification-List.pdf

2014 *Wyoming 2014 Integrated 305(b) and 303(d) Report: Draft*. Document #14-1021. Wyoming Department of Environmental Quality.

2015a Source Water Wellhead Protection. Wyoming Department of Environmental Quality. Available at: http://deq.wyoming.gov/wqd/source-water-wellhead/. Accessed: July 2015.

2015b Wise View and OGER databases. Available at: http://qrywiz.wyo.gov/. Accessed: June 13, 2015.

Wyoming Department of Revenue

2014 *Annual Report*. Available at: https://sites.google.com/a/wyo.gov/wy-dor/dor-annual-reports

Wyoming Department of Transportation (WYDOT)

2013 Annual Average Daily Traffice data for WYDOT available at http://www.dot.state.wy.us/home/planning_projects/Traffic_Data.default.html. Access June 8, 2015.

2014 *Road Design Manual*. Available at: http://www.dot.state.wy.us/home/engineering_technical_programs/manuals_publications/road_design_manual.html. Accessed: August 2014.

2015a Wyoming Department of Transportation Wyoming State Route Log: 200 through 299 Available at: http://www.aaroads.com/west/wy-200.htm. Accessed: June 10, 2015.

2015b Wyoming Road Info Interactive Transportation System Map. Available at: https://apps.wyoroad.info/itsm/map.html. Accessed June 8, 2015.

Wyoming Division of State Parks and Historic Sites and Trails

2009 The Wyoming State Parks, Historic Sites, and Trails, Wyoming Statewide Comprehensive Outdoor Recreation Plan (2009 to 2013)

Wyoming Economic Analysis Division

2015a Population for Wyoming, Counties, Cities, and Towns: 2010 to 2040. Available at: http://eadiv.state.wy.us/pop/wyc&sc40.htm. Accessed March 10, 2016.

2015b Wyoming and County Profiles 2015. Available at: http://eadiv.state.wy.us/demog_data/County_Profile.html. Accessed: March 10, 2016.

Wyoming Game and Fish Department (WGFD)

2010a *State Wildlife Action Plan 2010*. Wyoming Game and Fish Department.

2010b Wyoming 2010 Species of Greatest Conservation Need. Wyoming Game and Fish Department.

Wyoming Hospital Association

n.d. Find a Hospital. Available at: http://www.wyohospitals.com/find.asp. Accessed: June 18, 2015.

Wyoming State Engineer's Office (SEO)

2016 Maps and Spatial Data. Available at http://seo.wyo.gov/documents-data/maps-and-spatial-data. Acessed on March 14, 2016.

Wyoming State Geological Survey (WSGS)

2014a Greater Green River Basin. Available at: http://www.wsgs.wyo.gov/docs/wsgs-web-greater-green-river-basin.pdf.

2014b Wind River Basin. Available at: http://www.wsgs.wyo.gov/docs/wsgs-web-wind-river-basin.pdf.

Wyoming State Historic Preservation Office (SHPO)
n.d. Oregon, California, Mormon, Pioneer, and Pony Express Trails. Electronic document, http://wyoshpo.state.wy.us/trailsdemo/sublettegreenwood.htm. Accessed: June 16, 2015.

Wyoming Water Development Office (WWDO)
2002 Powder/Tongue River Basin Water Plan Final Report. Available at: http://waterplan.state.wy.us/plan/powder/2002/finalrept/finalrept.html. Accessed on January 1, 2016.
2006 Platte River Basin Water Plan Final Report. Available at: http://waterplan.state.wy.us/plan/platte/2006/finalrept/finalrept.html. Accessed on January 19, 2016.
2010a Green River Basin Water Plan. Available at: http://waterplan.state.wy.us/plan/green/green-plan.html. Accessed on January 18, 2016.
2010b Wind/Bighorn River Basin Water Plan. Available at: http://waterplan.state.wy.us/plan/bighorn/bighorn-plan.html. Accessed on January 18, 2016.
2016 Wyoming State Water Plan. Available at: http://waterplan.state.wy.us. Accessed on March 14, 2016.

Y

Yentsch, Andrew T., and Ronald J. Rood.
2007 "The Prison Site: Evidence for Late Archaic Housepits in the Salt Lake Valley." Utah Archaeology 20 (1):43-59.

Z

Zanazzi, A. and M.J. Kohn.
2008 Ecology and physiology of White River mammals based on stable isotope ratios of teeth. Palaeo 257:22-37.

Zietz, Vanesa, Scott Phillips, John Kennedy, Paul Burnett, Matthew Bandy, and Norma Crumbley
2010 Class III Cultural Resource Inventory for the Druckley Dune Field in Sublette County, Wyoming. Report submitted to the Bureau of Land Management, Pinedale Field Office.

Zonneveld, J.P., G.F. Gunnell, and W.S. bartels.
2000 Early Eocene fossil vertebrates from the southwestern Green River Basin, Lincoln and uinta counties, Wyoming. Journal of Vertebrate Paleontology 20(2):369-386.

Chapter 4

A

Ambrose, Skip and Chris Florian
2013 Sound Levels of Gas Field Activities at Greater Sage-grouse Leks, Pinedale Anticline Project Area, Wyoming, April 2013

Andersson, Malte, Johan Wallander, and Daniel Isaksson.
2009 "Predator Perches: A Visual Search Perspective." *Functional Ecology* 23, no. 2 (November 20, 2008): 373-79. Accessed July 27, 2016. doi:10.1111/j.1365-2435.2008.01512.x.b, c, an ddAvian Power Line Interaction Committee.
2006. *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*. Edison Electric Institute, APLIC, and the Californian Energy Commission. Washington, D.C. and Sacremento, CA.

B

Boxall, P.C.
2004 Impact of Oil and Natural Gas Facilities on Rural Residential Property Values: A spatial Hedonic Analysis. Resource and Energy Economics, Vol. 27. Pp. 248-269, 2004.

Bureau of Land Management (BLM)
1987 Oil and gas GIS data provided by BLM Lander Field Office, Wyoming.
1995 *Bravo Field Development Environmental Assessment*. Rock Springs District Office, Green River Resource Area.
1996 Fontenelle Natural Gas Infill Drilling Projects, Sweetwater and Lincoln Counties, Wyoming Final Environmental Impact Statement.
1998 *Record of Decision for Jonah Field II Natural Gas Project, Environmental Impact Statement, Sublette County, Wyoming*. Bureau of Land Management, Pinedale and Green River Resource Areas, Rock Springs District, Rock Springs, Wyoming.
2004 Environmental Assessment for Hay Reservoir Unit Natural Gas Infill Development Project, Rawlins Field Office, Wyoming.
2005 Environmental Assessment for Bitter Creek Shallow Oil and Gas Project, Sweetwater County, Wyoming, Rock Springs Field Office, Wyoming.
2006 Final Reasonable Foreseeable Development Scenario for Oil and Gas, Kemmerer Field Office, Wyoming. October 2006.
2008a Record of Decision for Final Supplemental Environmental Impact Statement for Pinedale Anticline Oil and Gas Exploration and Development Project
2008b Solid mineral withdrawal GIS data provided by BLM Pinedale Field Office.
2008c *Surface Ownership*. Instructional Memorandum No. UT 2008-046.
2009 Reasonable Foreseeable Development Scenario for Oil and Gas Scenario for Oil and Gas Lander Field Office, Wyoming.
2010 Environmental Assessment for Luman Rim Natural Gas Development Project in Sweetwater County, Wyoming, Rock Springs Field Office, Rock Springs, Wyoming.
2011a Plan of Development (POD) for Normally Pressured Lance Natural Gas Development Project, Sublette County, Wyoming, Pinedale and Rock Springs Field Offices, Wyoming.
2011b North Pacific Creek Wilderness Inventory Form for WYO040-2011-059. Provided by BLM on September 20, 2015.
2011c Mowing Machine Draw Wilderness Inventory Form for WYO040-2011-069. Available at: http://www.blm.gov/wy/st/en/field_offices/Rock_Springs/LWCI.html.
2011d Bush Creek Wilderness Inventory Form for WYO040-2011-074. Available at: http://www.blm.gov/wy/st/en/field_offices/Rock_Springs/LWCI.html.
2012a *Continental Divide-Creston Natural Gas Project Draft Environmental Impact Statement*. Rawlins Field Office, Wyoming. December 2012. Available at: http://www.blm.gov/wy/st/en/info/NEPA/documents/rfo/cd_creston.html.
2012b *Manual 6280: Management of National Scenic and Historic Trails and Trails Under Study or Recommended as Suitable for Congressional Designation*. Washington, D.C. Available at: http://www.blm.gov/pgdata/etc/medialib/blm/wo/Information_Resources_Management/policy/blm_manual.Par.1039.File.dat/M6280%20NSHT%20Management_Final_091212%20(2).pdf
2013a Environmental Assessment for Monell/Arch Units Oil and Gas Development, Rock Springs Field Office, Rock Springs, Wyoming.
2013b *Final Environmental Impact Statement for the Gateway West Transmission Line Project* Wyoming and Idaho. Bureau of Land Management Wyoming State Office. April 2013.
2013c Final Reasonable Foreseeable Development Scenario for Oil and Gas, Rock Springs Field Office, Wyoming.

BLM

2014a Scoping Announcement for Bird Canyon Natural Gas Infill Project. May 9, 2014. Available at: http://www.blm.gov/wy/st/en/info/news_room/2014/may/09rsfo-bird.html.

2014b Scoping Report, Bird Canyon Natural Gas Infill Project Environmental Impact Statement, Rock Springs Field Office, Rock Springs, Wyoming.

2014c *Final Scoping Report for the Draft Environmental Impact Statement for the Riley Ridge to Natrona Project*. High Desert District, Rock Springs, Wyoming. Available at http://www.blm.gov/wy/st/en/info/NEPA/documents/rsfo/RRNP.html.

2015a Dry Piney Deep Project Fact Sheet and Proposed Action. Available at: http://www.blm.gov/wy/st/en/info/NEPA/documents/pfo/DryPineyDeep.html

2015b Land and Mineral Legacy Rehost 2000 System – LR2000. Leases, mining claims, and mineral development data. Available at: http://www.blm.gov/lr2000/.

2015c NEPA Hotsheet May 4, 2015 BLM Wyoming Land Use Plans and Proposed Projects.

2015d Record of Decision and Approved Resource Management Plan Amendments for the Rocky Mountain Region including the Greater Sage-Grouse Sub-Regions of Lewistown, North Dakota; Northwest Colorado; and Wyoming and the Approved Resource Management Plans for Billings, Buffalo, Cody, HiLine, Miles City, Pompeys Pillar National Monument, South Dakota, and Worland. Washington, D.C. September 24.

2015e *Sheep Mountain Uranium Project Environmental Impact Statement*. January 2015. Available at: http://www.blm.gov/wy/st/en/info/NEPA/documents/lfo/sheepmtn.html.

Burnett, Paul, and Naomi Ollie

2017 *Overview of Known Cultural Resources along the Riley Ridge to Natrona Project, Wyoming: Addendum 1, Sweetening Plant.* SWCA Cultural Resource Report Number 17-19. Prepared by SWCA Environmental Consultants, Sheridan, Wyoming. Submitted to Bureau of Land Management, Rock Springs Field Office, Rock Springs. Copies available from the Division of State History, Wyoming State Historic Preservation Office, Cheyenne.

C

Cavanaugh, W.J. and G.C. Tocci

2002 "Criteria for community acceptance of outdoor concert sound…a progress report on continuing research," Proc. *INTER-NOISE 2002*, Dearborn, Michigan, USA (Noise Control Foundation, Poughkeepsie, New York, USA, 2002)

Center for Climate Strategies (CCS)

2007 Wyoming Greenhouse Gas Inventory and Reference Case Projections 1990-2020. Prepared for Wyoming Department of Environmental Quality.

Cook, Benjamin

2013 *The Economic Contribution of CO2 Enhanced Oil Recovery in Wyoming 2010-2012* (July 1, 2013). USAEE Working Paper No. 14-159. Available at: http://ssrn.com/abstract=2411868 or http://dx.doi.org/10.2139/ssrn.2411868

Connelly, J. W., S.T. Knick, M.A. Schroeder, and S.J. Stiver.

2004 *Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats*. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, Wyoming. Available at: http://sagemap.wr.usgs.gov/docs/Greater_Sage-grouse_Conservation_Assessment_060404.pdf.

Cooney, G., M. Jamieson, J. Marriott, J. Bergerson, A. Brandt
2016 Updating the U.S. Life Cycle GHG Petroleum Baseline to 2014 with Projections to 20140 Using Open-Source Engineering-Based Models. Published November 22, 2016. American Chemical Society Publications. Available at: https://pubs.acs.org/doi/10.1021/acs.est.6b02819. Accessed February 20, 2018.

Council on Environmental Quality (CEQ)
1997 Environmental Justice. Guidance Under the National Environmental Policy Act. December 1997. Available at https://www.epa.gov/sites/production/files/2015-02/documents/ej_guidance_nepa_ceq1297.pdf Accessed on March 11, 2016.

Coupal, Roger, Gary Beauvais, Dennis Feeney, and Scott Lieske
2004 The Role and Economic Importance of Private Lands in Providing Habitat for Wyoming's Big Game. *Wyoming Open Spaces*. University of Wyoming. March 2004. B-1150. Available at: http://www.wyomingextension.org/agpubs/pubs/B1150.pdf.

D

Denbury Onshore, LLC
2018 *Enhanced Oil Recovery Utilizing Injected CO_2 - Bell Creek Field.* White paper on provided by Rusty Shaw to explain inquiry from the Bureau of Land Management. February 21, 2018.

Department of Energy (DOE)
2015a *Enhanced Oil Recovery.* Available at: http://energy.gov/fe/science-innovation/oil-gas-research/enhanced-oil-recovery. March 2015.
2015b Department of Energy, U.S. Energy Information Administration. *Montana Field Production of Crude Oil (Thousand Barrels per Day).* July 2015.
2015c AEO2015 National Energy Modeling System, runs REF2015.D021915A, LOWPRICE.D021915A, and HIGHPRICE.D021915A. 2015.

E

Egan, M.
1988 *Architectural Acoustics*. McGraw-Hill, Inc., New York, New York

U.S. Energy Information Administration
2017 *Petroleum and Other Liquids/Refinery Yeild (Percent)*. Available at: https://www.eia.gov/dnav/pet/pet_pnp_pct_dc_nus_pct_m.htm. Accessed February 20, 2018.
2018 *Energy-Related Carbon Dioxide Emissions by State, 2000-2015*. Release date January 22, 2018. Available at: https://www.eia.gov/environment/emissions/state/analysis/. Accessed February 22, 2018.

Environmental Protection Agency (EPA)
2014 Examination of the Multiplier Used to Estimate $PM_{2.5}$ Fugitive Dust Emissions from PM_{10}. Available at: http://www3.epa.gov/ttn/chief/conference/ei14/session5/pace.pdf. Accessed: August 2015.
2015a Clean Power Plant Toolbox for States, Clean Power Plan State Goal Visualizer (XLSM). Available at: http://www2.epa.gov/cleanpowerplantoolbox. Accessed: August 2015.
2015b 2011 National Emissions Inventory. Technology Transfer Network. Available at: http://epa.gov/ttn/cheif/net/2011inventory.html. Accessed: July 14, 2015.

Erathem-Vanir Geological Consultants
2012 Paleontological Resources Assessment Report (EVG-2012WY-232). Prepared for Denbury Onshore LLC, Plano, Texas by Erathem-Vanir Geological Consultants, Pocatello, Idaho, 157 p.

F

Farmer, Andrew M.
1993 The Effects of Dust on Vegetation- A Review. *Environmental Pollution* Issue 79, p. 63-75.

Federal Energy Regulatory Commission (FERC)
2008 Draft Environmental Impact Statement, AES Sparrows Point LNG Terminal and Pipeline Project. FERC/EIS – 0222D.
2018 Southeast Market Pipelines Project, Final Supplemental Environmental Impact Statement. FERC EIS 0279F. February 2018.

Federal Transit Administration (FTA)
2006 Transit Noise and Vibration Impact Assessment. FTA-VA-90-1003-06.

Feeney, Dennis, Gary Beauvais, Roger Coupal, Shawn Lanning, Scott Lieske, Nathan Nibbelink, and Kirk Nordyke
2004 Big Game Migration Corridors in Wyoming. University of Wyoming. *Wyoming Open Spaces*. April 2004 B-1155. Available at: http://www.uwyo.edu/wyndd/_files/docs/reports/wynddreports/n04fee01wyus.pdf.

H

Harrell, Destin
2008 *Peak Lek Attendance for Greater Sage-grouse within the Northern Bighorn Basin, Wyoming*. Technical Note 424. U.S. Department of the Interior. Bureau of Land Management, Cody Field Office, Wyoming 12 pp. Available at: www.blm.gov/nstc/library/techno2.htm.

Harris, C. (editor)
1998 Handbook of Acoustical Measurements and Noise Control. Acoustical Society of America.

Hobbs R.J., E. Higgs, and J.A. Harris
2009 Novel ecosystems: implications for conservation and restoration. Trends Ecol Evol 24:599-605Innes, Robin J. 2010. Linanthus pungens. Quoted in Fire Effects Information System. United States Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available at: http://www.fs.fed.us/database/feis/plants/shrub/ linpun/all.html . Accessed: June 2015.

Holleran, Matthew J.
2005 "Greater Sage-grouse Population Response to Natural Gas Field Development in Western Wyoming" (doctorate dissertation, University of Wyoming, 2005), Available at: http://eqc.state.wy.us/orders/Land%20Closed%20Cases/11-4803%20Lost%20Creek%20ISR,%20LLC/Exhibit%2012.pdf.

I

IMPLAN Group, LLC (IMPLAN)
2015 IMPLAN System (data and software), Available at: www.IMPLAN.com.

Intergovernmental Panel on Climate Change (IPCC)
2006 *2006 IPCC Guidelines for National Greenhouse Gas Inventories*; Volume 2, Energy; Chapter 5: Carbon Dioxide Transport, Injection and Geological Storage.

International Organization for Standardization
1996 Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation. Designation: 9613-2

K

Knick, S.T., S.E. Hanser, and K.L. Preston.
2013. Modeling ecological minimum requirements for distribution of greater sage-grouse leks-Implications for population connectivity across their western range, U.S.A.: Ecology and Evolution 3(6):1539-1551. http://dx.doi.org/10.1002/ece3.557.

Knight, D.H., G.P. Jones, W.A. Reiners, and W.H. Romme
2014 Mountains and Plains: The Ecology of Wyoming Landscapes, 2nd ed. Scottsdale, AZ: Yale University Press.

L

Lendrum, P.E., C.R. Anderson Jr., K.L. Monteith, J.A. Jenks, and R.T. Bowyer.
2013. Migrating Mule Deer: Effects of Anthropogenically Altered Landscapes. PLoS ONE. 8:e64548 http://dx.doi.org/10.1371/journal.pone.0064548

M

Marcellus Shale Education & Training Center
2011 Economic Impacts of Marcellus Shale in Pennsylvania: Employment and Income in 2009. Marcellus Shale Education & Training Center. August 2011.

Miller, Richard F., Jeanne C. Chambers, David A. Pyke, Fred B. Pierson, and Jason C. Williams
2013 *A Review of Fire Effects on Vegetation and Soils in the Great Basin Region: Response and Ecological Site Characteristics*. General Technical Report. RMRS-GTR-308. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 126 p.

N

National Enhanced Oil Recovery Initiative
2012 Analysis for Carbon Dioxide Enhanced Oil Recovery…Detailed Methodology and Assumptions. May 25, 2012. Pages 5 and 6.

Neutrium
2017 *Specific Energy and Energy Density of Fuels*. Created March 26, 2014. Available at: https://neutrium.net/properties/specific-energy-and-energy-density-of-fuels/. Accessed February 20, 2018.

O

Office of Pipeline Safety (OPS).
1996 Natural disaster Study: National Pipeline Risk Index. U.S. Department of Transportation, Pipeline and Hazardous Material Safety Administration, Office of Pipeline Safety.

Ollie, Naomi, Paul Burnett, John Kennedy, and Cody Newton
2016 *Overview of Known Cultural Resources along the Riley Ridge to Natrona Project, Wyoming*. SWCA Cultural Resource Report Number 15-198. Prepared by SWCA Environmental Consultants, Sheridan, Wyoming. Submitted to Bureau of Land Management, Rock Springs Field Office, Rock Springs. Copies available from the Division of State History, Wyoming State Historic Preservation Office, Cheyenne.

P

Planning Information Corporation
1988 *Transportation Technical Report*. Prepared for USDI, BLM for Amoco CO2 Project EIS. Casper, Wyoming. Available at: http://archive.org/details/transportationte53unit.

R

Rockwell, Nicole Sauvageau, Stephanie Slaughter, and Anne McKibbin
2012 National Historic Trails Inventory: Summary of Field Inventory along the Oregon, Mormon Pioneer, California, and Pony Express Trails Corridor, in Fremont, Lincoln, Natrona, Sublette, Sweetwater, and Uinta Counties, Wyoming. Prepared by Metcalf Archaeological Consultants, Inc., Eagle and Golden, Colorado. Prepared for AECOM, Fort Collins, Colorado.

S

Sandercock, Brett and Kathy Martin
2011 *Ecology, Conversation, and Management of Grouse*. Published for the Cooper Ornthilogical Society *Issue 39 of Studies in Avian Biology*. University of California Press, 2011. Available at: https://books.google.com/books?id=vuocreLnCp4C&pg=PA138&lpg=PA138&dq=Connelly,+sage+grouse+reproductive+success&source=bl&ots=vjHcWfbZdT&sig=xGoEQ.3x-l1YJK_476kNbh2WDsow&hl=en&sa=X&ved=0CF8Q6AEwCGoVChMIvaDFgtyByQIVTvdjCh0acAI-#v=onepage&q=Connelly%2C%20sage%20grouse%20reproductive%20success&f=false.

Sawyer, H. and M.J. Kauffman.
2011 Stopover ecology of a migratory ungulate. *Journal of Animal Ecology*. 80(5):1078–87.

Sawyer, H.
2014 Seasonal distribution patterns and migration routes of mule deer in the Red Desert and Jack Morrow Hills Planning Area. Western Ecosystems Technology, Inc., Laramie, Wyoming.

Stewart, W.W., and B.A. Street
1992 Greater Green River Basin and Overthrust Belt, Wyoming Geological Association, Wyoming Oil and Gas Fields Symposium, p. 201-205.

SWCA Environmental Consultants (SWCA)
2014a Riley Ridge to Natrona Project Plan of Development Riley Ridge Unit Development Project Sublette, Sweewater, Fremont and Natrona Counties, Wyoming.
2014b Resource Report 1: General Project Descrription, Riley Ridgee to Natrona Project. August 2014.
2014c Resource Report 5: Socioeconomics. March 2014.
2014d Resource Report 6: Geology. March 2014.
2014e Resource Report 9: Air Quality and Noise. March 2014.

U

U.S. Census Bureau
2013 American Community Survey (ACS) 2009-2013. Available at: http://www.census.gov/acs/www/. Accessed: June 02, 2015.

U.S. Energy Information Administration
2014 U.S. Energy Related Carbon Dioxide Emission, 2013. Available at: http://www.eia.gov/environment/emissions/carbon/. Accessed: August 2015.

U.S. Forest Service (USFS)
2013 Visibility Data Summary: Bridger and Fitzpatrick Wilderness, WY. June 2013. Available at: https://www.fs.fed.us/air/documents/IMPROVE_Data_Summary_BRID1.pdf. Accessed: January 2016.
2014 Bridger Wilderness: 40 Years of Air and Water Quality Monitoring. Presented at the Wilderness 50th Anniversary Speaker Series at the Teton County Library, WY. September 2014. Available at: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3820612.pdf. Accessed: January 2016.

U.S. Geological Service (USGS)
2014 Mineral Resources On-Line Spatial Data: Active mines and mineral plants in the U.S. Available at: http://mrdata.usgs.gov/mineplant/ .
2015a Mineral Resources On-Line Spatial Data: Mineral Resources Data System. Available at: http://mrdata.usgs.gov/mrds/.
2015b Gap Analysis Program (GAP). National Land Cover, Version 2.

U.S. Nuclear Regulatory Commission
2015 Kennecott-Sweetwater Uranium Recovery Facility Site Summary. Available at: http://www.nrc.gov/info-finder/materials/uranium/licensed-facilities/is-sweetwater.pdf

W

Watson, J.E.
1980 Catalog of Wyoming Stratigraphy. Intermountain Consulting Service, The Geological Division of Took Engineering, Casper, Wyoming.

Wyoming Department of Environmental Quality (WDEQ)
2008 Interim Policy on Demonstration of Compliance with WAQSR Chapter 6, Section 2(c) (ii) for Sources in Sublette County.

Wyoming Game and Fish Department
2016 Unofficial Document. Density Disturbance Caluation Tool Data and Application Steward. 50092.00 Denbury RRNP (Part A) Final Results. July 6, 2016.

Wyoming Pipeline Authority (WPA)
2016 Website. Available at: https://www.wyopipeline.com/projects/wpci/. Accessed on: February 2016.

Chapter 5

B

Bureau of Land Management (BLM)

2014 *Final Scoping Report for the Draft Environmental Impact Statement for the Riley Ridge to Natrona Project*. High Desert District, Rock Springs, Wyoming. Available at http://www.blm.gov/wy/st/en/info/NEPA/documents/rsfo/RRNP.html.

THIS PAGE INTENTIONALLY LEFT BLANK

Glossary

GLOSSARY

A

A.D. – Anno Domini. Dating system devised in 525 to enumerate the years used with the Julian and Gregorian calendars, which are based on the traditionally reckoned year of the birth of Jesus of Nazareth.

A-weighted sound level – Sound that is measured with a sound-level meter using the A-weighted response filter built into the meter circuitry. The A-weighted filter simulates the frequency response to the human ear.

Abandonment – (1) Abandonment indicates that a company has received approval from the regulator to cease providing a particular service (e.g., to permanently shut down operation of a particular pipeline or facility) under that regulatory agency's jurisdiction.

Access (road) – Road used for passage to and along the project for purposes of construction and maintenance.

Active lek – Any lek that has been attended by male greater sage-grouse during the strutting season. Presence can be documented by observing birds using the site or by signs of strutting activity.

Active raptor nest site – Any identified raptor nest site that could provide a nesting opportunity for a raptor. Temporal and spatial stipulation will be applied.

Advisory Council on Historic Preservation (ACHP) – An independent federal agency that advises the President and Congress on historic preservation matters and oversees the review of projects under Section 106 of the National Historic Preservation Act.

Affected environment – (1) A geographic area and the associated natural, human, and cultural resources that could be influenced by a proposed action. (2) The chapter in an environmental impact statement (EIS) that describes the existing condition of the environment.

Agency Interdisciplinary Team – A group of individuals with different training, representing the physical sciences, social sciences, and environmental design arts, assembled to solve a problem or perform a task. The members of the team proceed to a solution with frequent interaction so that each discipline can provide insights on any stage of the problem and disciplines can combine to provide new solutions.

Agency-required mitigation – Measures or techniques developed and required by the Bureau of Land Management or cooperating agencies to reduce adverse impacts on a case-by-case or selective basis, such as where high or moderate impacts are anticipated.

Aggregate – A group or mass of distinct things gathered into, or considered as, a total or a whole.

Albedo – A measure of a material's ability to reflect sunlight (including the visible, infrared, and ultraviolet wavelengths) on a scale of 0 to 1. An albedo value of 0.0 indicates the surface absorbs all solar radiation, and a 1.0 albedo value represents total reflectivity. The *ENERGY STAR Reflective Roof Products* criteria specify an albedo of 0.65 or higher for low-slope roof applications and 0.25 for sloped roofs.

Alignment – The specific, surveyed route of the project.

All-terrain vehicle (ATV) – A wheeled or tracked vehicle, other than a snowmobile or work vehicle, designed primarily for recreational use or for the transportation of property or equipment exclusively on undeveloped road rights-of-way, marshland, open country, or other unprepared surfaces.

Allotment – An area of land where one or more livestock operators graze their livestock. Allotments consist of land administered by the Bureau of Land Management and usually include other federally managed, state-administered, and private land. An allotment may include one or more pastures. Livestock numbers and periods of use are specified for each allotment.

Alluvium – A general term for clay, silt, sand, gravel, or similar consolidated material deposited during a comparatively recent geologic time by a stream or other body of running water in the bed of a stream, river, or floodplain, or as a cone or fan at the base of a mountain slope.

Alternating current (AC) – The flow of electric charge periodically reverses direction. (In direct current [DC], the flow of electric charge is only in one direction.)

Alternative (action) – An option for meeting the stated need.

Alternative (route) – An optional path or direction for the project.

Ambient air – Any unconfined portion of the atmosphere: open air, surrounding air.

Amendment – The process for considering or making changes in the terms, conditions, and decisions of approved land-use plans using the prescribed provisions for resource management planning appropriate to the proposed action or circumstances.

American Indian tribe – Indian tribes as defined in the National Historic Preservation Act of 1966 54 U.S.C. 300101 (as recodified): Indian tribe means an Indian tribe, band, nation, or other organized group or community, including a Native village, Regional Corporation or Village Corporation, as those terms are defined in section 3 of the Alaska Native Claims Settlement Act (43 U.S.C. 1602), which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians (54 U.S.C. 300101 et seq. [as recodified]).

Animal unit month (AUM) – A standardized unit of measurement of the amount of forage necessary for the sustenance of one animal unit for 1 month; also, a unit of measurement that represents the privilege of grazing one animal unit for 1 month. An animal unit is a standardized unit of measurement for range livestock or wildlife. Generally, one mature cow (1,000 pounds) or its equivalent, based on an average daily forage consumption of 26 pounds of dry matter per day.

Annual (ecology) – A plant that completes its development in one year or one season and then dies.

Appeal – A formal action requesting a decision be reviewed by a higher authority. For the Bureau of Land Management, this usually means review by the Interior Board of Land Appeals.

Anthropogenic – Caused or influenced by humans.

Appropriate Management Level (AML) – The number of wild horses and burros that can thrive in balance with other public land resources and uses.

Aquifer – A stratum of permeable rock, sand, etc., that contains water. Water source for a well.

Archaeology – The science that investigates the history of peoples by studying the material remains of past societies.

Area of Critical Environmental Concern (ACEC) – A Bureau of Land Management designation for an area within public lands where special management attention is required to protect and prevent irreparable damage to important historic, cultural, or scenic values; fish and wildlife resources or other natural systems or processes; or to protect life from natural hazards.

Areas of Influence – Areas where any project located within should consider potential effects to the threatened, endangered, proposed, and candidate species and designated and proposed Critical Habitat, in reference to Section 7 of the Endangered Species Act of 1973, as amended.

Artifact – Any object showing human workmanship or modification, especially from a prehistoric or historic culture.

Assemblage – A collection of species making up any co-occurring community of organisms in a given habitat.

Assessment (environment) – An evaluation of existing resources and potential impacts to those resources from a proposed act or change to the environment.

Attainment area – An area considered to have air quality as good as or better than the National Ambient Air Quality Standards, as defined in the Clean Air Act. An area may be an attainment area for one pollutant and a nonattainment area for others.

Authorized Officer – Any employee of the Department of the Interior to whom has been delegated the authority to perform the duties defined. Under the Bureau of Land Management standard delegation (Manual 1203), this is no lower than the Field Office or District Manager. Delegation below this level should be specific to an individual and a specific right-of-way project.

Auto Tour Route – A road, or series of roads, parallel to the National Historic Trail designated in the trail's comprehensive management plan to commemorate the historic route. Additionally, the route may provide opportunities to access high potential historic sites and high potential segments.

Avoidance (as it relates to mitigation) – Avoiding the impact altogether by not taking a certain action or parts of an action (40 Code of Federal Regulations [CFR] 1508.20) (e.g., also may include avoiding the impact by moving the proposed action to a different time or location).

Avoidance area – an area designated in a land use plan, for which use for a right-of-way should be avoided if possible.

B

B.P. – Before the present. As used in radiocarbon and other archaeological dating, the present is defined as A.D. 1950.

Backcountry byway – A road, classified amongst one of four types of roads, providing the "off-the-beaten-path-experience" adventure.

Background – The portion of the visual landscape lying from the outer limit of the middleground to infinity. Color and texture are subdued in this area, and visual sensitivity analysis is primarily concerned with the two-dimensional shape of landforms against the sky.

Background concentrations – Background concentrations are an essential part of the total air quality concentration to be considered when determining source impacts. Background air quality includes pollutant concentrations due to (1) natural sources, (2) nearby sources other than those currently under consideration, and (3) unidentified sources.

Batch plant – An area used for concrete mixing, temporary field office facility, material storage, and stations for equipment maintenance during construction. The area usually covers approximately 2 acres.

Bureau of Land Management Sensitive – A plant or animal species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the Endangered Species Act of 1973.

Biological Assessment – A detailed document written by the agency proposing a major federal action with the potential to affect species listed under the Endangered Species Act of 1973.

Biological Opinion – A detailed document written by the U.S. Fish and Wildlife Service that determines the potential impacts of a major federal action on species listed under the Endangered Species Act of 1973.

Bowen ratio – The ratio of energy available for sensible heating to energy available for latent heating.

Burial – Unmarked human interment or grave.

C

Cairn – A stack or mound of rocks used to mark the locations of boundaries or mining claims.

Candidate species – Any species included in the *Federal Register*'s Notice of Review being considered for listing as threatened or endangered by the U.S. Fish and Wildlife Service.

Campsite – A site occupied by a limited number of individuals either seasonally or for short periods of time. Such a site is frequently characterized by the presence of limited activity areas, artifact scatters (e.g., lithic debitage, lithic tools, ground stone, and ceramics), thermal features, or scatters of fire-cracked rock.

Capability – The ability to generate or transmit power.

Carbon monoxide (CO) – A colorless, odorless, poisonous gas produced by incomplete fossil fuel combustion. One of the six criteria pollutants.

Cenozoic – An era of geologic time from the beginning of the Tertiary period (65 million years ago) to the present.

Centerline – A line along the approximate middle of the project right-of-way.

Circuit – A complete, closed conducting path over which electric current may flow.

Clear and cut – Above-grade removal of vegetation to improve or provide suitable access for equipment. All vegetation is removed using above-grade cutting methods that leave the root crown intact. Soils are compacted, but no surface soil is removed. A dozer, grader, or other type of equipment may be used to move boulders or other obstructions that prevent overland travel. Additionally, minor areas where the planned access crosses a side slope that exceeds the allowable slope for access by construction or maintenance vehicles, may be graded to provide safe passage. The disturbed area will be blended, to the extent practicable, into the existing grades and revegetated according to the prescribed mitigations.

Colluvium – Soil and rock detritus accumulated at the bottom of a slope.

Compensatory mitigation – Compensating for the impact by replacing or providing substitute resources or environments (40 CFR 1508.20).

Compensatory mitigation reversals – Damage to functioning compensatory mitigation sites that may be caused by natural disturbances (unintentional reversal, such as wildfire) or anthropogenic disturbances (intentional reversal, such as development) that shorten the intended duration of compensatory mitigation.

Compensatory mitigation projects – Specific, on-the-ground actions (mitigation measures) to improve or preserve habitats (e.g., chemical vegetation treatments).

Compensatory mitigation sites – The durable areas where compensatory mitigation projects will occur.

Compressor Pump Stations – Compressor pump stations are facilities located along a natural gas pipeline which compress the gas to a specified pressure, thereby allowing it to continue traveling along the pipeline to the intended recipient.

Connectivity – The degree to which the landscape facilitates animal movement and other ecological flows.

Conformance – A proposed action must be provided for specifically in a land use plan or, if not specifically mentioned, must be clearly consistent with the terms, conditions, and decisions of the approved plan or plan amendment.

Conservation Easement – An easement to assure the permanent preservation of land in its natural state or in whatever degree of naturalness the land has when the easement is granted.

Constraint – Environmental or engineering conditions or management prescriptions for a specific area limiting or precluding access to or siting of structures or facilities (e.g., terrain, airports, utility exclusion areas, etc.).

Contrast – The effect of a striking difference in the form, line, color, or texture of an area being viewed.

Contrast rating – A method of determining the extent of visual impact for an existing or proposed activity that would modify any landscape feature (land and water form, vegetation, and structures).

Cooperating agency – Any agency that has special jurisdiction by law or special expertise for proposals covered by the National Environmental Policy Act (40 CFR 1501.6). Any federal, state, tribal, or local government jurisdiction with such qualifications may become a cooperating agency, by agreement with the lead agency, to assist the lead agency in developing an environmental assessment or environmental impact statement.

Corridor – A tract of land forming a passageway for linear utilities or transportation uses.

Council on Environmental Quality (CEQ) – An advisory council to the President of the United States established by National Environmental Policy Act. This council reviews federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

Cretaceous – The final period of the Mesozoic era spanning the time between 145 and 65 million years ago.

Criteria pollutant – The 1970 amendments to the Clean Air Act required the Environmental Protection Agency to set National Ambient Air Quality Standards for certain pollutants known to be hazardous to human health. The Environmental Protection Agency has identified and set standards to protect human health and welfare for six pollutants: ozone, carbon monoxide, particulate matter, sulfur dioxide, lead, and nitrogen dioxide. The term "criteria pollutants" derives from the requirement that the Environmental Protection Agency must describe the characteristics and potential health and welfare effects of these pollutants. Standards are set or revised based on these criteria.

Critical habitat – Any particular range or habitat component that is the determining factor in a population's ability to maintain and reproduce at a certain level over the long-term.

Crucial habitat – Any particular range or habitat component that is the determining factor in a population's ability to maintain and reproduce at a certain level over the long-term.

Crucial winter range – The portion of the winter range to which a wildlife species is confined during periods of heaviest snow cover.

Cultural resource – Any resource associated with the human cultural environment; examples include artifacts and historic artifacts, archaeological sites, historic sites, ethnographic sites; historic properties, and traditional cultural properties.

Cultural assemblage – The complete inventory of artifacts from a defined archaeological unit.

Cumulative effect – The effect on the environment that results from the incremental impact of an action when added to other past, present, or reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR 1508.7 and 1508.25). Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time (40 CFR 1508.7).

Current (electric) – A flow of electrons in an electrical conductor. The strength or rate of movement of the electricity is measured in amperes.

D

Decision-maker – The agency official who has been delegated authority to approve an action and is responsible for issuing a decision to implement a proposed action. Synonyms include authorized official, authorized officer, responsible official, and responsible manager.

Degradation – The wearing down, or away, and general lowering or reduction of the earth's surface by the processes of weathering and erosion.

Demand (electric) – The rate at which electric energy is delivered to or by a system, part of a system or piece of equipment, at a given instant or averaged over any designated period of time.

***De minimis* levels –** The minimum threshold for which a conformity determination must be performed, for various criteria pollutants in various areas.

Design features of the Proposed Action – Measures or procedures incorporated into the proposed action or an alternative implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts. Because these features are built into the proposed action or alternative, design features are not considered mitigation.

Designated utility (or right-of-way) corridor – A parcel of land with specific boundaries identified by law, Secretarial Order, the land-use planning process, or other management decision as being a preferred location of existing and future rights-of-way. The corridor may be suitable to accommodate more than one type of right-of-way or one or more rights-of-way that are similar, identical, or compatible.

Direct current (DC) – The flow of electric charge is only in one direction. (In alternative current [AC], the flow of electric charge periodically reverses direction.)

Direct effect – Effects caused by the action (i.e., construction) and occur at the same time and place (40 CFR 1508.8(a).

Discharge (water) – The rate of flow or volume of water flowing in a stream at a given location or within a given period of time.

Dispersed recreation – Recreation activities of an unstructured type that are not confined to specific locations such as recreation sites. An example of these activities may be hunting, fishing, off-highway vehicle use, hiking, and sightseeing.

Displacement – A temporary or permanent migration of an animal species from an area as a result of a disturbance.

District– A district possesses a significant concentration or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development.

Disturbance – A temporary change in environmental conditions that causes a pronounced change in an ecosystem.

Diversity – The relative abundance of wildlife species, plant species, communities, habitat, or habitat features per unit of area.

Drive and crush – Driving overland within a staked overland access route. The landscape is not altered other than compaction of soil under the vehicle tires/tracks, and the vegetation may be crushed but not cleared or uprooted.

Dump – A formal or informal concentration of historic trash; related to subsistence practices and containing single or multiple episodes of deposition.

E

Ecology – The relationship between living organisms and their environment.

Economic base – An area's economic base comprises industries that are primarily responsible for bringing outside income into the local economy. Economic base analysis measures the relative importance of industries for a particular area by comparing employment and income levels to a reference area (e.g., the United States).

Ecoregion – A major ecosystem defined by distinctive geography and receiving uniform solar radiation and moisture.

Ecosystem – A complex system composed of a community of plants and animals and includes the system's chemical and physical environment.

Effect – Impact on the human environment brought about by an agent of change or action. Effects analysis predicts the degree to which the environment will be affected by an action. The CEQ uses the terms effect and impact synonymously in the National Environmental Policy Act regulations. Other synonyms include consequence, result, and outcome. Effects can be beneficial or detrimental, and may be direct, indirect, or cumulative.

Electric and magnetic field (EMF) – A space or region within which magnetic forces are present around an electrical current (also referred to as electromagnetic field).

Electric field – Electric effect resulting from the voltage on a transmission line. Measured as volts per meter or kilovolts per meter.

Emergent (vegetation) – Vegetation with all or part of their vegetative and reproductive parts above the water.

Endangered species – A plant or animal species whose prospects for survival and reproduction are in immediate jeopardy, as designated by the Secretary of the Interior. It is further defined by the Endangered Species Act of 1973, as amended.

Endemic – Plants or animals native to a particular region or country.

Energy Corridor – a parcel of land (often linear in character) that has been identified through the land use planning process as being a preferred location for existing and future utility rights-of-way, and that is suitable to accommodate one or more rights-of-way which are similar, identical or compatible.

Environment – The surrounding conditions, influences, or forces that affect or modify an organism or an ecological community and ultimately determine its form and survival.

Environmental Impact Statement (EIS) – A detailed written statement, as required by Section 102(2)(C) of National Environmental Policy Act, when an agency proposes a major federal action significantly affecting the quality of the human environment.

Environmental justice – The pursuit of equal justice and equal protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, and/or socioeconomic status. Federal agencies must incorporate environmental justice as part of their mission by identifying and addressing the effects of programs, policies, and activities to ensure the opportunity for

full and fair participation by affected communities in the decision-making process and avoid, minimize, or mitigate disproportionately high and adverse health and environmental effects on minority and low-income populations.

Environmental assessment (EA) – An environmental assessment under the National Environmental Policy Act is a concise public document that provides sufficient evidence and analysis for determining whether the Health Resources and Service Administration should issue a Finding of No Significant Environmental Impact or prepare an environmental impact statement.

Eocene – The epoch of the Tertiary period spanning the time between 56 and 33.9 million years ago.

Eolian – Wind-blown sand or silt material, which when deposited forms dunes or small sandy ridges.

Ephemeral – Present only during a portion of the year and generally refers to water courses.

Erosion – The wearing away of the land surface by running water, wind, ice, or other geological agents.

Escarpment – A steep slope or cliff formed by erosion or, less often, by faulting.

Exclusion area – An area identified through land-use plans or in the process of designating corridors for which rights-of-way are to be excluded.

Ethnography – The study and systematic recording of human cultures. Also, the descriptive body of work produced from such research.

Extensive Recreation Management Area (ERMA) – Areas where significant recreation opportunities and problems are limited and explicit recreation management is not required. Minimal management actions related to the Bureau of Land Management's stewardship responsibilities are adequate in these areas.

Extirpate – To destroy completely.

Extraction – The act of extracting or drawing a substance out of the earth (e.g., mining).

F

Fault – A fracture or fracture zone in the earth's surface along where there has been displacement of the sides, relative to one another and parallel to the fracture.

Fauna – The wildlife or animals of a specified region or time.

Feature – A complex artifact or part of a site such as a thermal feature, soil stain, depression, rock alignment, or activity area.

Federal Energy Regulatory Commission (FERC) – The agency primarily responsible for ensuring adequate energy supplies at just and reasonable rates and providing regulatory incentives for increased productivity, efficiency, and competition.

Federal land – All lands owned by the United States except land (1) in the National Park System, (2) held in trust for an Indian or Indian tribe, or (3) on the Outer Continental Shelf.

Federal Land Policy and Management Act of 1976 (FLPMA) – Public Law 94-579 of October 21, 1976. This law is often referred to as the Bureau of Land Management's Organic Act, which provides the majority of the Bureau of Land Management's legislated authority, direction, policy, and basic management guidance.

Federal Register – The official daily publication for rules, proposed rules, and notices of federal agencies and organizations, as well as executive orders and other presidential documents. The *Federal Register* is published by the Office of the Federal Register, National Archives and Records Administration.

Fire-cracked rock – Rock which has been discolored, cracked, or altered by exposure to fire.

Fishery – The complex of interactions within and between the population(s) of fish being harvested, the population(s) or anglers, and the environment of each.

Floodplain – The portion of a river or stream valley, adjacent to the river channel, which is built of sediments and inundated with water when the stream overflows its banks.

Forage – All browse and herbaceous foods available to grazing animals that may be grazed or harvested for feeding.

Foreground – The visible area from a viewpoint or use area out to a distance of 0.5 mile. The ability to perceive detail in a landscape is greatest in this zone.

Foreground-middleground – The area visible from a travel route, residence, or other use area to a distance of 3 to 5 miles. The outer boundary of this zone is defined as the point where texture and form of individual plants are no longer apparent in the landscape. Vegetation is apparent only in patterns or outline.

Fossil – The remains or traces of an organism or assemblage of organisms preserved by natural processes in the earth's crust; exclusive of organisms buried since the beginning of historical time.

Fragmentation – A reduction in area of undisturbed, continuous habitat. Often affects interior forest species that depend on unbroken expanses of mature coniferous forest.

Fuels management – Fuels are vegetation (alive or dead) that can carry fire. Management of fuels includes attempting to modify fire behavior should a wildland fire occur.

Fugitive dust – Dust put into the atmosphere by the wind blowing over plowed fields, dirt roads, or desert or sandy areas with little or no vegetation. Also caused by mechanically generated particulate matter emissions put into the air because of vehicles or equipment moving soil or driving over unpaved roads (or dirty paved roads) and dusty areas.

G

Game species – Mammal, bird, or fish species managed at the state government level for the purposes of sport, hunting, or trapping.

Gauss – Measurement of the magnetic flux intensity (intensity of magnetic field attraction per unit area).

General Habitat Management Areas (GHMA) – Bureau of Land Management-administered greater sage-grouse habitat that is occupied seasonally or year-round and is outside of Priority Habitat

Management Areas, where some special management would apply to sustain greater sage-grouse populations.

Generalist – A species that is able to thrive in a wide variety of environmental conditions and can make use of a variety of different resources

Generation source – Generating facilities convert various forms of energy into electric power.

Genus – One of the major taxonomic groups used to scientifically identify plants or animals. Several closely related species, or one species, make up one genus, while several genera or one genus make up a family.

Geologic formations – A rock unit distinguished from adjacent deposits by some common character, such as its composition, origin, or the type of fossil associated with the unit.

Geology – The science that relates to the earth, the rocks of which it is composed, and the changes the earth has undergone or is undergoing.

Geothermal resource – Heat found in rocks and fluids at various depths that can be extracted by drilling or pumping for use as an energy source. This heat may be residual heat, friction heat, or a result of radioactive decay.

Grant – Any authorization or instrument (e.g., easement, ease, license, or permit) the Bureau of Land Management issues under Title V of the FLPMA, 43 U.S.C. 1761 et seq. The term includes those authorizations and instruments the Bureau of Land Management and its predecessors issued for like purposes before October 21, 1976, under the existing statutory authority. It also includes any authorization or instrument the Bureau of Land Management issues pursuant to other right-of-way authorities such as the Act or March 3, 1891 (43 U.S.C. 946-951) as to other than public and national forest land. It does not include authorizations issued under the Mineral Leasing Act (30 U.S.C. 185).

Grassland Reserve Program – A program administered by the U.S. Department of Agriculture Natural Resources Conservation Service and Farm Service Agency that provides financial assistance to landowners and operators to protect eligible grazing lands by voluntarily limiting future development and crop uses on the lands. (Food Security Act of 1985)

Grazing Allotment – An area of land designated and managed for grazing of livestock. It may include private, state, and public lands under the jurisdiction of the Bureau of Land Management and/or other federal agencies.

H

Habitat – The region where a plant or animal naturally grows or lives. A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and home range.

Habitat fragmentation – A reduction in area of undisturbed, continuous habitat. Often affects interior forest species that depend on unbroken expanses of mature coniferous forest.

Habitation – A site inhabited or used intensively over an extended period of time, either year-round or on a seasonal basis. Habitations are frequently characterized by multiple activity areas, extensive and diverse

scatters of lithic debitage and specialized tools, ceramics, architectural remains, storage structures, thermal features, and well-developed middens.

Habitat obligate – Species that is limited in its habitat to a few specific environmental conditions

Hazardous air pollutants (HAP) – Air pollutants not covered by ambient air quality standards, but may present a threat of adverse human health effects or adverse environmental effects, specifically pollutants listed in Section 112(b) of the federal Clean Air Act.

Herbaceous – Of, or having the nature of, an herb or herbs, as distinguished from woody plants.

Hibernaculum – The place of abode in which an animal seeks refuge.

High Potential Historic Site – Sites located in proximity to the route providing an opportunity to interpret the historic significance of the trail during the period of its major use. Criteria for consideration as high potential sites include historic significance, presence of visible historic remnants, scenic quality, and relative freedom from intrusion.

High Potential Trail Segment – Segment of a trail which would afford high quality recreation experience in a portion of the route having greater than average scenic values or affording an opportunity to vicariously share the experience of the original users of a historic route.

Herd Management Area (HMA) – An area that has been designated for continuing management of wild horses.

Historic property – Any district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP) (maintained by the Secretary of the Interior [36 CFR 800]).

Historic Properties Treatment Plan (HPTP) – Identifies treatments for historic properties that will be adversely affected by construction of a project, and to suggest avoidance and mitigation measures to preserve the integrity of these cultural resources, or salvage any information that will be lost by construction of a project.

Horizontal directional drilling (HDD) – A steerable trenchless method of installing underground pipe, conduit, or cable in a shallow arc along a prescribed bore path by using a surface-launched drilling rig with minimal impact on the surrounding area.

Housepits – Semi-subterranean features, with or without a prepared floor, roughly round or oval in plan view and roughly basin-shaped in profile.

Human Environment – Includes the natural and physical environment and the relationship of people with that environment.

I

Impact – See *Effect*

Implementation plan – A site-specific plan written to implement decisions made in a land-use plan. An implementation plan usually selects and applies best-management practices to meet land-use-plan objectives.

Indicator species – A plant or animal species that provides a characterization of the larger environment.

Indian Tribe – See *American Indian Tribe*

Indirect effect – Caused by the action later in time or farther removed in distance, but still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth-rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR 1508.8(b)).

Indirect impact –See *Indirect effect*

In-kind (as it relates to mitigation) – In-kind mitigation is the replacement or substitution of resources or values of the same type and kind as those affected (e.g., greater sage-grouse habitat is lost, and greater sage-grouse habitat is enhanced or conserved).

Instruction Memorandum – A memorandum containing policy or procedure.

Insulator – A device resistant to electrical conduction used for isolating and supporting conductors.

Interdisciplinary Team – See *Agency Interdisciplinary Team*

Interior Board of Land Appeals (IBLA) – The IBLA is an appellate review body that exercises the delegated authority of the Secretary of the Interior to issue final decisions for the Department of the Interior. Its administrative judges decide appeals from bureau decisions relating to the use and disposition of public lands and their resources, mineral resources on the Outer Continental Shelf, and the conduct of surface coal mining operations under the Surface Mining Control and Reclamation Act. Located within the Department's Office of Hearings and Appeals, IBLA is separate and independent from the Bureaus and Offices whose decisions it reviews.

Intermittent – A river or stream that flows for a period of time, usually seasonally during rainy periods, and stops during dry periods. In arid regions, dry periods may be interrupted by occasional flash floods from brief but intense rain storms.

Invasive species – A species that is not native (or is alien) to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm to human health (Executive Order 13112).

Issue – An issue is a point or matter of discussion, debate, or dispute about the potential environmental effects of an action. Issues point to environmental effects and may influence the development of alternatives to the proposed action.

J

Jeopardy – A state where the both the likelihood of survival and recovery of a plant or animal species is appreciably reduced.

Jurassic – The middle period of the Mesozoic era spanning the time between 201.3 and 145 million years ago, characterized by the dominance of dinosaurs and the appearance of flying reptiles and birds.

Jurisdictions – The limits or territory within which authority may be exercised.

K

Kcmil – Abbreviation for a thousand circular mils. Kcmil is a unit used to express large conductor sizes.

Key Observation Point (KOP) – The most critical viewing location(s) where a contrast rating can be performed such as views from communities or typical views from representative landscapes.

Kilovolt (kV) – A kilovolt is equal to 1,000 volts. This unit of measurement is most commonly used when describing transmission and distribution lines.

L

Lacustrine – Lakes and ponds that have more than 2 acres in surface area.

Landform – A term used to describe the many types of land surfaces that exist because of geologic activity and weathering (e.g., plateaus, mountains, plains, and valleys).

Land Use Plan – A set of decisions that establish the direction for management of land within an administrative area, (pertaining to federal land, as prescribed under the planning provisions of FLPMA).

Lek – A traditional courtship-display area attended by male greater sage-grouse in or adjacent to sagebrush-dominated habitat. Designation of the site as a lek requires the observation of two or more male sage-grouse engaged in courtship displays. New leks must be confirmed by a survey conducted during the appropriate time of day and during the strutting season. Observation of signs of strutting also can be used to confirm a suspected lek.

Land and Water Conservation Fund Site (LWCF) – The National Park Service (NPS) provides matching grants to state and local governments for acquisition and development of public outdoor recreation areas and facilities. (Section 6(f)(3) of the LWCF Act)

Linear facility – Project or action with linear features such as roadways (i.e., interstates, state routes, minor roads, and off-highway vehicle routes), transmission and distribution line rights-of-way, federally designated utility corridors, existing highways (e.g., I-15, I-70, and I-80; U.S. Highways 287 and 191), pipelines, and railroads.

Linear sites – Any roadway, from freeway to footpath; utility lines, telephone, telegraph lines, fence lines, and power lines; railroads; and waterways

Linear KOP – A critical viewpoint that is a commonly traveled route i.e., highways, trails, recreational corridors. See Key Observation Point

Link – A segment of an alternative route sharing common endpoints with adjacent links. Endpoints of a link are determined by the location of intersections with other segments (links) of other routes.

Lithics – A general term used to refer to chipped stone artifacts or debitage.

Lithic landscape – Co-occurrence, in a given geographic space, of different structural units each one composed by a raw material source and unmodified and human-modified pieces of rock extracted from that source and then transported, used, and discarded across the landscape.

Lithic procurement area – An area from which raw materials were obtained and removed for lithic tool manufacture and refurbishing.

Lithology – The structure and composition of a rock formation and the study of rocks with the unaided eye or with little magnification.

Load (electric) – The amount of electric power delivered or required at any specific point or points on a system. The requirement originates at the energy-consuming equipment of the consumers.

LR2000 – Bureau of Land Management's Legacy Rehost System (LR2000) provides a searchable database for public reports on Bureau of Land Management land and mineral use authorizations, conveyances, mining claims, withdrawals and classifications.

M

Megawatt (MW) – The generation of electricity is measured in megawatts; 1 MW equals 1,000 kilowatts or 1 million watts.

Magnetic field – Electric effect resulting from an electric current flowing in a conductor. Unit of measurement is a Gauss.

Mesozoic – An era of geologic time between the Paleozoic and the Cenozoic eras, spanning the time between 252.17 and 66 million years ago.

Metamorphic – A rock formed through metamorphism. Metamorphism is the change in the mineralogical, structural, or textural composition of rocks under intense heat and pressure (e.g., turning limestone into marble).

Migration corridors – Routes followed by animals, birds, or fish when traveling between seasonal habitats.

Migratory – Birds, animals, or people that migrate or move from one region or country to another.

Mineral – Any inorganic or organic substance occurring naturally in the earth that has a consistent and distinctive set of physical properties. Examples of minerals include coal, nickel, gold, silver, and copper.

Minimization (as it relates to mitigation) – Minimizing impacts by limiting the degree or magnitude of the action and its implementation (40 CFR 1508.20).

Miocene – The epoch of the Tertiary period spanning the time between 23.03 and 5.3 million years ago.

Mitigate – To alleviate, reduce, or render less intense or severe.

Mitigation – Measures or procedures that could reduce or avoid adverse impacts and have not been incorporated into the proposed action or an alternative. Mitigation can be applied to reduce or avoid adverse effects on the human environment.

Monitoring – Actions performed to ensure compliance with the terms, conditions, and stipulations of a grant or temporary-use permit.

Mound (structural) – A pile of material and sediments that probably represent the remains of a habitation structure.

Mudstone – A hardened sedimentary rock consisting of clay that is similar to shale but does not occur in distinct, bonded layers.

Multiple Use – Coordinated management of various surface and subsurface resources so that they are used in the combination that will best meet present and future needs.

N

National Ambient Air Quality Standards (NAAQS) – The Clean Air Act requires the Environmental Protection Agency to set NAAQS (40 CFR part 50) for pollutants considered harmful to public health and the environment. The Clean Air Act established two types of national air quality standards: (1) *Primary standards* set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly and (2) *Secondary standards* set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. The Environmental Protection Agency Office of Air Quality Planning and Standards has set NAAQS for six principal pollutants, which are called criteria pollutants.

National conservation area – An area designated by Congress, generally, to conserve, protect, enhance, and properly manage the resources and values for which it was designated for the benefit and the enjoyment of present and future generations (Bureau of Land Management Manual 6220).

National Environmental Policy Act of 1969 (NEPA) – Public Law 91-190. An Act that encourages productive and enjoyable harmony between man and his environment, promotes efforts to prevent or eliminate damage to the environment and biosphere, stimulates the health and welfare of man, enriches the understanding or the ecological systems and natural resources important to the nation, and establishes the CEQ.

National Gap Analysis Program – A program of the U.S. Geological Survey that provides land cover datasets providing for the analysis, inventory and research of vegetation communities.

National Historic Preservation Act of 1966 (NHPA) – Public Law 89-665; 16 U.S.C. 470 et seq. A law authorizing the Secretary of the Interior to expand and maintain a National Register of Historic Places and directing federal agencies to take into account the effects of their actions on historic properties and provide the ACHP a reasonable opportunity to comment.

National Historic Trail (NHT) – A continuous trail commemorating historic routes of exploration, migration, trade, communication, or military action designed by Congress which (1) follows as closely as possible to the actual route of historic use, (2) is of national significance, and (3) has significant potential for public recreation and/or interpretation opportunities.

National monument – Area designated by the president of the United States by proclamation pursuant to the Antiquities Act of 1906 for the protection, restoration, or enhancement of the resources, objects, and values for which it was designated. (Bureau of Land Management Manual 6220)

National Register of Historic Places (NRHP) – A list of districts, sites, buildings, structures, and objects maintained by the NPS, each determined by NPS to be of historic, cultural, architectural, archaeological,

or engineering significance at the local, state, or national level, established by the Historic Preservation Act of 1966.

National Scenic Trail (NST) – A continuous, long-distance trail designated by Congress to provide for maximum outdoor recreation potential and for the conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of the areas through which the trail traverses.

National Trails System Act of 1968 (NTSA) – Public Law 90-543 (amended through Public Law 111-11); 16 U.S.C. 1246. A law enabling Congress to designate National Scenic and National Historic Trails to provide outdoor recreation opportunities and promote preservation of the Nations outdoor areas and historic resources. Also enables the Secretary of the Interior or Agriculture to establish National Recreation Trails on lands they administer.

Native American – A member of any of the aboriginal peoples of the western hemisphere, especially native peoples of the United States and its territories, including American Indians, Alaska Natives, Native Hawaiians, Chamorros, and American Samoans. *Refer to American Indian tribe*.

Native species – A species that, other than as a result of an introduction, historically occurred or currently occurs in an ecosystem (Executive Order 13112).

Native vegetation – Natural vegetation originating in a certain region or country.

Nitrogen dioxide (NO_2) – The result of nitric oxide (a gas formed by combustion and a precursor of ground-level ozone pollution, also known as smog) combining with oxygen in the atmosphere and a major component of photochemical smog. One of the six criteria pollutants.

Nitrogen oxides (NO_x) – Product of combustion from transportation and stationary sources consisting of a mixture of nitrogen and oxygen compounds, including nitric oxide and nitrogen dioxide.

No Surface Occupancy (NSO) – A leasing stipulation that prohibits occupancy or disturbance on all or part of the lease surface to protect special values or uses.

Node – The common endpoint of adjacent links.

Nonattainment area – Area that does not meet one or more of the National Ambient Air Quality Standards for the criteria pollutants designated in the Clean Air Act.

Non-wilderness study area lands (WSA) with wilderness characteristics – Those lands that have been inventoried and determined by the Bureau of Land Management to contain wilderness characteristics as defined in Section 2(c) of the Wilderness Act of 1964, 16 U.S.C. 1131, et seq. These attributes include the area's size, its apparent naturalness, and outstanding opportunities for solitude or a primitive and unconfined type of recreation.

Notice of availability (NOA) – The *Federal Register* notice that an EIS (draft or final) or record of decision (ROD) is available. Publication of a notice of filing of an EIS by the Environmental Protection Agency formally begins the public comment period.

Notice of intent (NOI) – This *Federal Register* notice announcing that an environmental impact statement or an environmental assessment level land-use plan will be prepared. Public of this notice formally starts the scoping process.

Notice to proceed – A written authorization by the Authorized Officer that allows the holder to initiate actions under the grant. A notice to proceed usually is used to allow a grant to be issued, while preventing the holder from starting surface-disturbing activities before a plan of development (POD) is approved. The Authorized Officer can issue separate notices to proceed if the project involves distinct work phases and/or locations. Each notice to proceed will specify the nature of the work, location, and dates to be authorized.

Noxious weed – A plant species designated by federal or state law as generally possessing one or more of the following characteristics: aggressive and difficult to manage; parasitic; a carrier or host of serious insects or disease; or non-native, new, or not common to the United States.

O

Obligate – Species that is limited in its habitat to a few specific environmental conditions.

Oligocene – The epoch of the Tertiary period spanning the time between 33.7 and 23.8 million years ago.

100-year flood – A flood with a magnitude that may occur once every 100 years. A 1-in-100 chance of a certain area being inundated during any year.

Occupied lek – A lek that has been active during at least one strutting season within the last 10 years. Management protection will be afforded to occupied leks.

Occurrence – A record of a plant or animal species at a known location.

Off-highway vehicle (OHV) – Any motorized vehicle capable of, or designed for, travel on or immediately over land, water, or other natural terrain, excluding: (1) Any nonamphibious registered motorboat; (2) Any military, fire, emergency, or law enforcement vehicle while being used for emergency purposes; (3) Any vehicle whose use is expressly authorized by the authorized officer, or otherwise officially approved; (4) Vehicles in official use; and (5) Any combat or combat support vehicle when used in times of national defense emergencies.

Opportunity – Areas of opportunities for siting a pipeline; typically include linear features such as existing and future overhead lines, designated utility corridors, existing interstate and intrastate highways, pipelines, and railroads and areas where there are no environmental constraints precluding access to or siting of structures or facilities.

Out-of-kind (as it relates to mitigation) – Out-of-kind is the replacement or substitution of resources or values that are not the same type and kind as those affected but are related or similar (e.g., greater sage-grouse winter habitat is lost, but elk habitat is enhanced or conserved).

Outage – The period during which a generating unit, transmission line, or other facility is out of service.

Ozone (O_3) – A form of oxygen produced when an electric spark is passed through oxygen or air. One of six criteria pollutants.

P

Paleocene – The first geologic epoch of the Cenozoic Era covering the time between 66 and 56 million years ago. This is the era immediately following the extinction of the dinosaurs.

Paleontology – The science that deals with the life of past geological ages through the study of the fossil remains of organisms.

Paleontological resources – Any fossilized remains, traces, or imprints of organisms, preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of life on earth.

Paleozoic – The geologic era between the Precambrian and Mesozoic eras covering the time between 541 million and 252.17 million years ago. The era was characterized by the development of the first fish, amphibians, reptiles, and land plants.

Palustrine – A marsh or marsh-like environment.

Particulate Matter – Minute, separate particles, such as dust or other air pollutants. PM_{10} is a measure of particles in the atmosphere with a diameter of less than, or equal to, a nominal 10 micrometers aerodynamic equivalent diameter. $PM_{2.5}$ is a measure of particles in the atmosphere with a diameter of less than, or equal to, a nominal 2.5 micrometers aerodynamic equivalent diameter. These are criteria pollutants.

Parturition – The action of giving birth to young.

Per capita income – Calculated by dividing total income in a specified area (e.g., county) by the area's population.

Perch deterrents – Structures installed on structures designed to discourage bird perching, typically by birds of prey or corvids.

Perennial – Lasting or active through the whole year. May refer to rivers, streams, or plants.

Petroglyph – A design or motif pecked, incised, abraded, scratched, or carved with a sharp element into a rock surface.

Physiographic province – An area characterized by distinctive topography, geologic structure, climate, drainage patterns, and other features and phenomena of nature.

Pictograph – A design or motif produced by painting with mineral pigments on a rock surface; painted rock art.

Pipeline – A long pipe, typically underground, for conveying oil, gas, etc., over long distances.

Pithouse – A habitation structure built entirely or partially underground.

Plan of Development (POD) – A complete description of and design for the proposed project. It includes, but is not limited to, proposed plans, specifications, construction methods, schedules, restoration practices, and other information pertinent to the proposal; the POD becomes part of the right-of-way grant

or permit. The POD can include sections for construction, maintenance, and termination. The content of the POD will vary with the complexity of the proposal.

Plateau – An elevated tract of relatively level land, such as a tableland or mesa.

Playa – The shallow central basin of a desert plain where water gathers after a rain and is evaporated.

Pleistocene – The first geologic epoch during the Quaternary period, spanning from 2.6 million years ago to about 9000 Before Present, characterized by extensive continental glaciations in the Northern Hemisphere.

Policy – A guiding principle on which a specific decision or set of decisions is based.

Pollinator – The species, typically a type of insect, which transfers pollen from one plant to another allowing for cross-fertilization and subsequent seed development. Many plant species require pollinators to transfer pollen between widely separated individuals.

Population – A group of organisms, all of the same species, which occupies a particular area. The term is used to refer to the number of individuals of a species within an ecosystem or of any group of like individuals.

Potential Fossil Yield Classification (PFYC) – A system of classification by which geologic units are classified based on the relative abundance of vertebrate fossils or scientifically significant invertebrate or plant fossils and their sensitivity to adverse impacts, with a higher class number indicating a higher potential. This classification is applied to the geologic formation, member, or other distinguishable unit, preferably at the most detailed mappable level. The PFYC system is meant to provide baseline guidance for predicting, assessing, and mitigating paleontological resources. The classes that serve as guidelines for identifying potential for a formation to yield fossils include Class 1 – Very Low, Class 2 – Low, Class 3 – Moderate or Unknown, Class 4 High, and Class 5 – Very High.

Power – A term usually meant to imply both energy and capacity.

Precambrian – The earliest geologic era covering all time from the formation of the earth and ending at the Paleozoic Era, which began about 541 million years ago.

Preferred Alternative – The alternative believed to reasonably accomplish the purpose and need for the proposed action while fulfilling the statutory missions and responsibilities, considering economic, environmental, technical, and other factors. This alternative may or may not be the same as the applicant's preferred alternative.

Primitive – An area that is not developed; a pristine natural area.

Priority Habitat Management Areas (PHMAs) – Bureau of Land Management-administered lands identified as having highest habitat value for maintaining sustainable greater sage-grouse populations.

Project area – The preliminary study area defined to examine all feasible siting corridors for the Project. Established by the Applicant's interest and objectives for the Project, the Project description, and other siting criteria such as potential major substation interconnect points, existing designated utility corridors, geography, and land-use designations (e.g., National Parks, wilderness areas).

Proposal – The stage in the development of an action when a federal agency has a goal and is actively preparing to make a decision on one or more alternative means of accomplishing that goal and the effects can be meaningfully evaluated (40 FR 1508.23). When a federal agency receives or makes a proposal, the National Environmental Policy Act process begins.

Proposed species – A plant or animal species slated to be designated as threatened or endangered under the Endangered Species Act of 1973.

Proposed Action – A proposal for a federal agency to authorize, recommend, or implement an action to address a clear purpose and need. Alternatives are developed to consider different reasonable paths to take to accomplish the same purpose and need of the proposed action.

Protest – An opportunity for a qualified party to seek an administrative review of a proposed decision in accordance with program-specific regulations. For example, a protest may be filed with the Director of the Bureau of Land Management for review of a proposed resource management plan or plan amendment (43 CFR 1610.5-2), or a proposed grazing decision may be protested for review by the Authorized officer (43 CFR 4160.2).

Public land (Federal Land Policy and Management Act) – Any land and interest in land owned by the United States within the several states and administered by the Secretary of the Interior through the Bureau of Land Management without regards to how the United States acquired ownership except (1) land located on the Outer Continental Shelf and (2) land held for the benefit of Indians, Aleuts, and Eskimos.

Public land (other) – As used in this document, federally owned surface or mineral estate specifically administered by the Bureau of Land Management.

Q

Quarry – An area from which rock or minerals (e.g., ore, limestone, coal, gravel, and sand pits) have been excavated and extracted for use off-site.

Quaternary – The second period of the Cenozoic era spanning 1.8 (recently refined to 2.6) million years ago to the present. This is the period of glaciations in the northern hemisphere.

Quaternary fault – A fault that has been active or has had displacement during the Quaternary Period, between 1.8 million years ago and the present. These faults are most likely to be active on human time scales.

R

Rangeland – Land on which the indigenous vegetation (climax or natural potential) is predominantly grasses, grass-like plants, forbs, or shrubs and is managed as a natural ecosystem.

Raptor – A bird of prey.

Range – A species geographic distribution.

Reclamation – Returning disturbed lands to a form and productivity that will be ecologically balanced.

Reconnaissance – Preliminary examination or survey of a territory.

Recontouring – Returning a surface to, or near to, its original form through some type of action, such as grading.

Record of decision (ROD) – A document separate from, but associated with, an EIS that publicly and officially discloses the responsible official's decision on the proposed action.

Recreation opportunity spectrum (ROS) – A planning process that provides a framework for defining classes of outdoor recreation environments, activities, and experience opportunities. The settings, activities, and opportunities for experiences are arranged along a continuum or spectrum of classes. The resulting analysis defines specific geographic areas on the ground, each of which encompasses one of the classes.

Rectify (as it relates to mitigation) – Rectifying the impact by repairing, rehabilitating, or restoring the affected environment (40 CFR 1508.20).

Reduce or eliminate over time (as it relates to mitigation) – Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action (40 CFR 1508.20).

Reference centerline – For purposes of assessing impacts and recommending mitigation, a centerline is assigned that may be slightly adjusted during engineering design.

Region – A large tract of land generally recognized as having similar character types and physiographic types.

Renewable resource – Any natural resource that can replenish itself naturally over time.

Research natural area – A part of a national network of ecological areas designated in perpetuity for research and education and/or to maintain biological diversity of National Forest System lands. Research Natural Areas are principally for nonmanipulative research, observation, and study. (Forest Service Manual-4063)

Residual impact – Those impacts remaining after the consideration and application of the first four aspects in the mitigation hierarchy have been applied to the proposed action or an alternative.

Reasonably foreseeable future action (RFFA) – Actions for which there are existing decisions, funding, formal proposals, or which are highly probable, based on known opportunities or trends.

Resource management plan – A set of decisions that establish the direction for management of land in an administrative area, in this case, land administered by the Bureau of Land Management, as prescribed under the planning provisions of the FLPMA, as amended, Public Law 94-579, 90 Stat. 2743.

Revegetation – The reestablishment and development of self-sustaining plant cover. On disturbed sites, this normally requires human assistance, such as reseeding.

Rhizomatous – Plants having a long underground stem system that cannot be viewed above ground and which may disintegrate over time.

Right-of-way – A permit or grant that authorizes the use of lands or certain specified purposes, commonly for pipelines, roads, telephone lines, electric transmission lines, reservoirs, etc.; also, the land covered by such a permit or grant.

Riparian – A transition between wetlands or water bodies and upland areas. An aquatic or terrestrial ecosystem associated with bodies of water, such as streams, lakes, or wetlands, or is dependent on the existence of perennial, intermittent, or ephemeral surface or subsurface water drainage. Riparian areas are usually characterized by dense vegetation and an abundance and diversity of wildlife.

Rock art – An inclusive term referring to both pictographs and petroglyphs.

Route – A route is the general path of a pipeline and associated facilities.

S

Sagebrush Focal Areas (SFA) – Areas of highest habitat values for greater sage-grouse and are managed to avoid new surface disturbance.

Sandstone – A common sedimentary rock primarily composed of sand grains, mainly quartz cemented together by other minerals.

Scenic backway – A paved or dirt road reaching secluded areas of natural beauty.

Scenic byway – A specially designated road that travels through an area of natural beauty.

Scenic quality – The visual appeal of a tract of land based on landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications in relationship to the natural landscape.

Scenic Quality Rating Unit (SQRU) – A portion of the landscape that displays primarily homogeneous visual characteristics of the basic landscape features (landform, water, vegetation, and structures and modifications), which separate it from the surrounding landscape.

Seasonal restriction – Measures or techniques that limit Project activities during certain time periods for a given plant or animal species that are designed to reduce adverse impacts during periods where the plant or animal is sensitive to disturbance.

Sediment – Solid fragmental material, either mineral or organic, transported or deposited by air, water, gravity, or ice.

Segment – A combination of links.

Selective Mitigation Measure – Measures or techniques developed and required by the Bureau of Land Management or cooperating agencies to reduce adverse impacts on a case-by-case or selective basis, such as where high or moderate impacts are anticipated.

Semi-arid – A climate or region characterized by little yearly rainfall and the growth of a number of short grasses and shrubs.

Sensitivity – The state of being readily affected by the actions of external influence.

Sensitivity Level Rating Unit (SLRU) – The designation (high, medium, or low) assigned to a landscape area to indicate the concern of the public to changes in the landscape (Bureau of Land Management designation).

Severe winter relief – A documented range that may or may not be defined as a crucial range. It is used to a great extent only in occasional extreme winters.

Significant impact – Effects of sufficient context and intensity that an EIS is required. The Council on Environmental Quality regulations at 40 CFR 1508.27(b) include ten considerations for evaluating intensity.

Simulation – The use of a computer to calculate the effect of a given physical process.

Site – In general, a compact area, usually involving nonlinear facilities (e.g., substation, series compensation station). In archaeology, any locale showing evidence of human activity.

Special recreation management area (SRMA) – An administrative unit where the existing or proposed recreation opportunities and recreation setting characteristics are recognized for their unique value, importance, and/or distinctiveness, especially as compared to other areas used for recreation.

Special recreation use permit – An authorization which allows for recreation uses of the public lands and related waters. It is issued as a means to control visitor use, protect recreational and natural resources, and provide for the health and safety of visitors. (Bureau of Land Management Handbook H-2930-1)

Special Status Species – A plant species designated by federal and state laws or federal agency policy as especially vulnerable requiring special management actions.

Specialist – Any plant or animal species that thrives or requires a narrow range of environmental conditions, or an animal species with a specific diet.

Species – A group of individuals of common ancestry that closely resemble each other structurally and physiologically and in nature interbreed, producing fertile offspring.

Species of Greatest Conservation Need – Species whose conservation status warrants increased management attention, and funding, as well as consideration in conservation, land use, and development planning, as determined by the Wyoming Game and Fish Department.

Spring – A place where groundwater flows naturally onto the land surface, often the source of a stream.

Staging Area – A designated area where vehicles, supplies, and construction equipment are positioned for use and access to a construction site.

Stipulation – A condition, requirement, or term specified in a grant.

Stone circle – Circular rock-alignments. There are a variety of uses and a range of morphologies for these features. Some may be the remains of dwellings (tipi rings), while others may have served spiritual purposes.

Structures – Structures support transmission lines. Structures are different sizes and shapes depending on the voltage of the line and number of circuits each tower structure needs to carry.

Study area – A given geographical area delineated for specific research.

Study corridor – The area of study (i.e., resource inventory and effects analysis) for a particular resource determined by the Agency Interdisciplinary Team; varies for each resource based on the area that potentially could be affected.

Subspecies – Any natural subdivision of a species that exhibits small, but persistent morphological variations from other subdivisions of the same species living in different geographical regions or times.

Substantive comment – A comment that does one or more of the following: (1) questions, with reasonable basis, the accuracy of information in the environmental impact statement or environmental assessment; (2) questions, with reasonable basis or facts, the adequacy of, methodology for, or assumptions used for the environmental analysis; (3) presents reasonable alternatives other than those presented in the environmental impact statement or environmental assessment; or (4) promotes the lead agency to consider changes or revisions in one or more of the alternatives.

Substation – An electrical power station that is the connection point between transmission and distribution systems. Substations house the equipment used to route, control, and protect the flow of power in the electrical system. It also is a facility in an electrical transmission system with the capability to transform power to a higher or lower voltage. Equipment includes transformers, circuit breakers, and other equipment for switching, changing, or regulating the voltage of electricity.

Substrates – Sediment that lies beneath the surface of the earth.

Sulfur dioxide (SO_2) – A pungent, colorless, gas formed primarily by the combustion of fossil fuels. One of the six criteria pollutants.

Synergistic – Interaction of conditions such that the total effect is greater than the sum of the individual effects.

T

Take – As defined by the Endangered Species Act of 1973, "to harass, harm, pursue, hunt, shoot, wound, kill, capture, or collect, or attempt to engage in any such conduct."

Talus – A pile of rock debris at the foot of a cliff or steep slope.

Taxonomy – A system of arranging animals and plants into natural, related groups based on some factor common to each, such as structure or biochemistry.

Technical Report – Documentation of detailed studies summarized in the Draft EIS.

Temporary-use permit – A document the Bureau of Land Management issues under 30 U.S.C. 185 that is a revocable, nonpossessory privilege to use specified federal land in the vicinity of and in connection with a right-of-way to construct, operate, maintain, or terminate a pipeline to protect the environment or public safety. It does not convey any interest in land.

Tertiary – The first period of the Cenozoic era (after the Mesozoic era and before the Quaternary period), spanning the time period between 66 and 2.6 million years ago.

Thermal feature – A localized area of controlled intentional burning. Includes fire pits, fire rings, burned rock rings, and slab-lined hearths.

Third-party contracting – Contracting for the preparation of National Environmental Policy Act documents that is funded by the non-federal proponent of an action. The federal agency must provide the direction for preparing the National Environmental Policy Act document and must approve the analysis and document.

Threatened Species – Any plant or animal species defined under the Endangered Species Act of 1973 as likely to become endangered in the foreseeable future throughout a significant portion or all of its range; listings are published in the *Federal Register*.

Toolstone – An artifact that has been intentionally modified by retouch or unintentionally modified by usewear. Examples of toolstones are projectile points, unifaces, and scrapers.

Traditional Cultural Property (TCP) – Any built or natural locations, areas, or features considered sacred or culturally significant by a group or people because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history and (b) are important in maintaining the continuing cultural identity of the community.

Transmission Line – Transmission lines connect the power produced at generating facilities to substations. Over long distances, it is most effective to transport electricity at high voltages.

Triassic – The first period of the Mesozoic era spanning the time between 252.17 and 201.3 million years ago, characterized by the first appearance of dinosaurs and mammals.

Tributary – A stream or river that flows into a larger stream or river.

U

Unauthorized use – The use, occupancy, or development of the public land without authorization or using, occupying, and developing them in a way that is beyond the scope and terms and conditions of an authorization. It includes acts or omissions causing undue or unnecessary degradation to the occupied public land.

Unemployed – Persons are classified as unemployed if they do not have a job, have actively looked for work in the prior 4 weeks, and are currently available for work. Persons who were not working and were waiting to be recalled to a job from which they had been temporarily laid off are also included as unemployed. The unemployment rate represents the number unemployed as a percent of the labor force.

Ungulate – A hoofed typically herbivorous quadruped mammal.

Uranium – A very hard, heavy, silvery, metallic, chemical element that is crucial to the research and development of atomic energy.

U.S. Geological Survey GAP Analysis Program – An element of the U.S. Geological Survey that is utilized to identify conservation gaps that help keep common species common; provide conservation information to the public so that informed resource management decisions can be made; and facilitate the application of GAP data and analysis to specific resource management activities.

Utility Corridor – Tract of land varying in width and forming a passageway through which various commodities, such as oil, gas, and electricity, are transported.

V

Vegetation communities – A combination of dominant plant species that live together in the same region or on the same landform.

Vegetation clearing – Clearing of vegetation in the Project right-of-way prior to Project construction.

Viewshed – Visible portion of the specific landscape seen from a specific viewpoint, normally limited by landform, vegetation, distance, and existing cultural modifications.

Village – A permanent habitation, strategically located (i.e., water sources), which contains substantial residential areas, clusters of architectural remains, domestic features, and a high density of diverse cultural material. May contain structural remains used for public activities.

Visual distance zone (VDZ) – A visibility threshold distance where visual perception changes. The zones are usually defined as foreground, middleground, and background.

Visual management objectives – The term used in this study to generally define Visual Resource Management (Bureau of Land Management) or Visual Quality Objectives (U.S. Forest Service).

Visual resource – Visible feature of the landscape, such as land, water, vegetation, and other features that make up the scenery of an area.

Visual resource inventory (VRI) classes – Classification of landscape areas composed of scenic quality, sensitivity level rating units (SLRU), and distance zones for inventory purposes (Bureau of Land Management).

Visual resource management (VRM) classes – Classification of landscapes according to the kinds of structures and changes acceptable to meet established visual goals (Bureau of Land Management).

Visual management system (VMS) – System to inventory existing scenic values and to manage U.S. Forest Service-administered lands based upon meeting visual management goals (U.S. Forest Service).

Visual quality objectives (VQO) – Classification of landscapes to set an acceptable level of alteration from the natural landscape (U.S. Forest Service).

Volatile organic compound (VOC) – Any organic compound that participates in atmospheric photochemical reactions except those designated by the Environmental Protection Agency as having negligible photochemical reactivity.

Volt – A measure of electrical potential difference that would cause a current of ampere to flow through a conductor whose resistance is 1 ohm.

Volts per meter – A unit of measurement of an electric field.

W

Waters of the United States – All waters currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including adjacent wetlands and tributaries to waters of the United States, and all waters by which the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce.

Watershed – All lands that are enclosed by a continuous hydrologic drainage divide and lay upslope from a specified point on a stream.

Watt – A unit of electrical power equal to 1/756 horsepower.

Wetlands – Those areas inundated by surface or groundwater with a frequency sufficient to support vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wild and scenic river (WSR) – A system of nationally designated rivers and their immediate environments that have outstanding scenic, recreational, geologic, fish and wildlife, historic, cultural, and other similar values and are preserved in a free-flowing condition. Types of streams include flowing bodies of water or estuaries or a section, portion, or tributary thereof, including rivers, streams, creeks, runs, kills, rills, and small lakes. The system consists of three types of streams: (1) recreation—rivers or sections of rivers that are readily accessible by road or railroad and may have some development along their shorelines and may have undergone some impoundments or diversion in the past; (2) scenic—rivers or sections of rivers free from impoundments with shorelines or watersheds still largely undeveloped but accessible in places by roads; and (3) wild—rivers or sections of rivers free of impoundments and generally inaccessible except by trails, with watersheds or shorelines essentially primitive and waters unpolluted.

Wild horse herd management area (WHHMA) – A herd area that has been evaluated and determined by the Bureau of Land Management to have adequate food, water, cover, and space to sustain healthy and diverse wild horse and burro populations over the long-term (Bureau of Land Management Handbook H-4700-1).

Wilderness Area– A congressionally designated area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation that is protected and managed to preserve its natural conditions, as described in Section 2A of the Wilderness Act of 1964.

Wilderness characteristics – Characteristics of lands that include a lack of permanent human improvements or habitation, primeval character intact, affected primarily by the forces of nature, and/or presence of outstanding opportunities for solitude or a primitive and unconfined type of recreation.

Wilderness study area – A roadless area or island of undeveloped federal land inventoried and found to possess wilderness qualities or attributes described under Title VI, Section 603 of the FLPMA and Section 2C of the Wilderness Act of 1964. These characteristics include the following:

(1) generally appears to have been affected mainly by the forces of nature, with human imprints substantially unnoticeable
(2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation

(3) has at least 5,000 acres or is large enough to make practicable its preservation and use in an unimpaired condition
(4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historic value

Wilderness qualities or attributes – Key qualities or attributes of wilderness listed in section 2(c) of the Wilderness Act of 1964 and used by Bureau of Land Management in conducting wilderness inventories. These characteristics are features of the land associated with the concept of wilderness that specifically deals with naturalness and opportunities for solitude and primitive and unconfined recreation. These characteristics may be considered in land use planning when Bureau of Land Management determines those characteristics are reasonably present, of sufficient value (condition, uniqueness, relevance, importance), need (trend, risk), and practical to manage (from IM-2003-275, Change 1, Considerations of Wilderness Characteristics in Land Use Plan, Attachment 1).

Wildlife habitat management area (WHMA) – Special management areas designed to protect or preserve certain qualities or uses for wildlife and plant species. The environment in these areas is unique in some respects, and it is therefore desirable to apply to different management prescriptions to these areas from those of the surrounding public lands. The integration of different land-management goals, objectives, and actions will be implemented to ensure that the integrity of these areas will be maintained. They will be directed toward habitat management rather than species management and encompass featured species and species diversity to ensure compliance with existing laws prevent species from becoming threatened or endangered, and provide values and uses for the public.

Wind energy – Form of energy conversion in which turbines convert the kinetic energy of wind into mechanical or electrical energy that can be used for power.

THIS PAGE INTENTIONALLY LEFT BLANK

Index

INDEX

A

B

C

D

E

F

G

H

I

J

L

M

N

O

P

R

S

T

U

V

W

Y

Appendix A – Plan of Development

Appendix A – Preliminary Plan of Development

Appendix A presents the Applicant's preliminary Plan of Development (POD) submitted with their applications to the BLM for rights-of-way. The purpose of a Plan of Development is to communicate the Applicant's plan, which comprehensively identifies the environmental requirements for construction, operation, and maintenance of the Project. The POD is intended to be used Project-wide as (1) a summary of Project environmental requirements and protection measures, and (2) a description of the processes and procedures that will be used to ensure compliance (including the requirements of the BLM and other federal, state, and/or local agencies, as appropriate).

This preliminary POD will be revised to incorporate the measures and other applicable stipulations identified in the Environmental Impact Statement (EIS) for avoidance, minimization, and mitigation of the environmental impacts resulting from the implementation of this Project. The EIS-identified measures would be in accordance with BLM's *Draft – Regional Mitigation* Manual Section 1794 for the sequence of mitigation action of the mitigation hierarchy to avoid, minimize, rectify, reduce or eliminate over time, and compensate. Additions and/or amendments to the preliminary POD also are anticipated as a part of detailed engineering design of the Project and preconstruction resource surveys. In addition, the POD also must incorporate the various regulatory approvals, permits, and other authorizations that contain environmental requirements including those measures stipulated in BLM resource management plans and other land-use plans, as applicable.

The BLM expects mitigation measures and other specific stipulations and methods identified in the POD would be implemented over the entire length of the Project, regardless of jurisdiction, while understanding the federal land-management agencies do not have the authority to enforce mitigation measures on state and private land.

If the Project is approved, the final POD would become a condition of the BLM Records of Decision and an enforceable stipulation of the BLM right-of-way grants and potentially other permits.

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix B – Programmatic Agreement

DRAFT
PROGRAMMATIC AGREEMENT
AMONG
THE BUREAU OF LAND MANAGEMENT,
THE U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT,
THE NATIONAL PARK SERVICE, INTERMOUNTAIN REGION,
THE WYOMING STATE HISTORIC PRESERVATION OFFICER, AND
DENBURY RESOURCES, INC.
REGARDING COMPLIANCE WITH
THE NATIONAL HISTORIC PRESERVATION ACT
FOR THE
PROPOSED RILEY RIDGE TO NATRONA CO_2 PIPELINE PROJECT

WHEREAS, Denbury Green Pipeline – Riley Ridge LLC (Proponent) has submitted two applications for right-of-way (ROW) grants on federal lands to the Bureau of Land Management (BLM) in Wyoming in order to construct the Riley Ridge to Natrona CO_2 Pipeline Project (Project); and

WHEREAS, the Project is an approximately 244-mile-long liquefied carbon dioxide (CO_2) gas pipeline and related operations, including the Riley Ridge Sweetening Plant, two injection wells at the Sweetening Plant, and a new power line to supply energy to the Sweetening Plant. The CO_2 gas pipeline extends from the Riley Ridge Gas Plant in Sublette County, Wyoming, through Sweetwater and Fremont Counties in south central Wyoming, to the existing Denbury Greencore CO_2 Pipeline in Fremont or Natrona County, Wyoming, across federal, state, and local jurisdictions and private lands (Appendix A – Map of Proposed Route and Alternatives); and

WHEREAS, if the BLM approves the ROW grants, the Proponent intends to construct, operate, maintain, and decommission the Project according to general parameters contained in the approved Plan of Development (POD) for the Project which shall be appended to and made a part of the Record of Decision (ROD) authorizing the ROW grants; and

WHEREAS, the BLM has determined that issuance of the ROW grants and related authorizations is an Undertaking as defined at Title 36 Code of Federal Regulations (CFR) Part 800.16(y) that triggers the requirements of Title 54 United States Code (USC) § 306108, commonly known as Section 106 of the National Historic Preservation Act (NHPA) of 1966 (54 USC § 300101 et seq., as amended), hereinafter referred to as Section 106, on affected federal and non-federal lands during the planning, construction, operation, maintenance, and decommissioning of the Undertaking; and

WHEREAS, the BLM has determined that the Undertaking may have direct, indirect, and cumulative effects on cultural resources included in or eligible for inclusion in the National Register of Historic Places (NRHP), hereinafter called historic properties; and

WHEREAS, the BLM recognizes that historic properties may also include Traditional Cultural Properties (TCPs). A TCP is defined as a type of historic property that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that are rooted in that community's history, and are important in maintaining the continuing cultural

identity of that community, per National Park Service (NPS) Bulletin 38. A community may include a Native American tribe, local ethnic group, or the people of the nation as a whole. TCPs may include historic properties that Native American communities consider to be traditional ecological knowledge properties or of traditional religious and cultural importance; and

WHEREAS, the proposed or alternative routes may affect segments of the California National Historic Trail (NHT), the Mormon Pioneer NHT, the Oregon NHT, and the Pony Express NHT, which are administered by the NPS and managed by the BLM; and

WHEREAS, the BLM, in consultation with the Wyoming State Historic Preservation Officer (SHPO) and other Consulting Parties, has defined the Area of Potential Effect (APE) for the Undertaking based on potential direct, indirect, and cumulative effects to historic properties and their associated settings as applicable, as defined at 36 CFR 800.16(d), to include the areas identified in Stipulation II.A of this Programmatic Agreement (PA); and

WHEREAS, the effects on historic properties cannot be fully determined prior to approval of the Undertaking; the BLM, in consultation with the Consulting Parties, has determined to use a phased process to identify historic properties (36 CFR 800.4[b][2]) and assess the effects on those properties (36 CFR 800.5[a][3]), such that completion of the identification and evaluation of historic properties, findings of effect on historic properties, and consultation concerning measures to avoid, minimize, or mitigate any adverse effects will be carried out in phases as part of planning for and prior to any Notice to Proceed (NTP) and Undertaking implementation; and

WHEREAS, the BLM has determined that a PA documenting the terms and conditions for compliance with Section 106 will be negotiated among Consulting Parties according to 36 CFR 800.14(b)(1)(ii); and

WHEREAS, for purposes of the Undertaking, the BLM Wyoming High Desert District Office is the lead federal agency for compliance with Section 106 on behalf of the BLM, the NPS, and the U.S. Army Corps of Engineers (USACE) (federal agencies) (36 CFR 800.2[a][(2]), as evidenced by the signing of this PA by any responsible federal agency official, and is the primary contact for all Consulting Parties to this PA including federally recognized Native American tribes; and

WHEREAS, the regulations at 36 CFR Part 800.6(c)(1–3) recognize three types of signatories to this PA: **Signatories**, **Invited Signatories**, and **Concurring Parties,** which are referred to collectively as **the Parties** or **the Consulting Parties**. Signatories and Invited Signatories may include any party who assumes responsibilities under this agreement. Concurring Parties have a demonstrated interest in the undertaking or its effects on historic properties, but do not assume responsibilities under the agreement. Concurring Parties may participate in development of the document and may concur with this agreement. The refusal of any Invited Signatory or Concurring Party to sign does not invalidate the PA; however, the decision not to sign shall not preclude their continued or future participation as Consulting Parties to this Undertaking. Concurring Parties cannot amend or terminate this agreement; and

WHEREAS, the BLM has consulted with the SHPO, who is a Signatory to this PA; and

WHEREAS, the BLM has notified the Advisory Council on Historic Preservation (ACHP), pursuant to the NHPA Section 106 implementing regulations (36 CFR 800.14[a][1]), and the ACHP has declined to participate in consultation; and

WHEREAS, the BLM recognizes its government-to-government obligation to consult with federally recognized Native American tribes regarding TCPs or properties of traditional religious and cultural significance to tribes, including viewsheds and landscapes, that may be affected by the Undertaking and will continue to consult with affected Native American tribes; and

WHEREAS, the BLM, as lead agency for tribal consultation and coordination, has initiated consultation with the Cheyenne River Sioux Tribe, the Comanche Nation of Oklahoma, the Crow Creek Sioux Tribe, the Crow Tribe, the Eastern Shoshone Tribe of the Wind River Reservation, the Fort Peck Assiniboine and Sioux Tribes, the Northern Arapaho Tribe of the Wind River Reservation, the Northern Cheyenne Tribe, the Oglala Sioux Tribe, the Rosebud Sioux Tribe, the Shoshone-Bannock Tribes of the Fort Hall Reservation, the Sisseton-Wahpeton Oyate Tribes, the Standing Rock Sioux Tribe, the Ute Indian Tribe of the Uintah and Ouray Reservation, and the Yankton Sioux Tribe, and has invited all of these tribes to be Invited Signatories to this PA. Invited Signatories may include any participating tribe or any party who assumes responsibilities under this PA; and

WHEREAS, the following Native American tribes have participated as Invited Signatories to the PA, [list to be completed prior to final document]; and

WHEREAS, the USACE has determined that authorization for the Project to place structures in, under, or over navigable waters of the United States, as defined under 33CFR 329, pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 USC § 403), and the authorization for placement of dredge or fill material in waters of the United States as part of the Project, as defined under 33 CFR 328, pursuant to Section 404 of the Clean Water Act (33 USC § 1344), requires review under Section 106 and 36 CFR 800; and

WHEREAS, the USACE reserves the right as needed, to conduct additional consultations on a government-to-government basis with Native American tribes regarding permitting actions related to Section 10 of the Rivers and Harbors Act of 1899 (33 USC § 403), or Section 404 of the Clean Water Act (33 USC § 1344); and

WHEREAS, other Interested Parties have requested to be Consulting Parties in actions affecting the historic properties and the BLM has invited the Alliance for Historic Wyoming (Alliance), the Natrona County Commission, the Oregon-California Trail Association, the Sublette County Commission, and the Sweetwater County Commission to be Concurring Parties to this PA; and

WHEREAS, the following entities have participated as Concurring Parties to the PA [list to be completed prior to final document]; and

WHEREAS, the Proponent, as a potential grantee of the ROWs, has participated in consultation pursuant to 36 CFR 800.2(c)(4), and is an Invited Signatory to this PA; and

WHEREAS**,** the BLM will require that the Undertaking be executed in accordance with the conditions of the ROW grants and other authorizations that may be granted by the federal land managing agencies (the "Authorizations"), and in accordance with the stipulations of this PA, which shall be appended to and made a part of the ROD; and

WHEREAS, the BLM may issue ROW grants for the construction, operation, and maintenance, and eventual decommissioning of the Undertaking, and the ROW grants, if issued, will incorporate this PA by reference; and

WHEREAS, this PA will be incorporated into the approved project POD, and the Historic Properties Treatment Plans (Treatment Plans) will be developed pursuant to this PA;

NOW, THEREFORE, the Signatories and Invited Signatories to this PA agree that the Undertaking shall be implemented in accordance with the following stipulations in order to take into account the effects of the Undertaking on historic properties and to comply with Section 106 of the NHPA for the Undertaking.

The BLM will ensure that the following are implemented.

STIPULATIONS

I. GENERAL CONDITIONS

A. The BLM shall ensure that all historic preservation work conducted pursuant to this PA is conducted by, or under the direct supervision of, persons meeting qualifications set forth in the *Secretary of the Interior's Professional Qualification Standards* (36 CFR 61) or equivalent experience and who have been permitted for such work on public lands by the BLM.

B. The Proponent, in cooperation with the BLM and the SHPO, shall ensure that all its personnel, and all the personnel of its contractors, are directed not to engage in the illegal collection of historic and prehistoric materials. The Proponent shall cooperate with the BLM to ensure compliance with the Archaeological Resources Protection Act (ARPA) of 1979 (16 USC 470) on public lands, and with Wyoming Statute §36-1-115 on state lands.

C. Personnel Training

1. All personnel (including contractors; inspectors; monitors; and new, added, or replaced personnel) involved in construction, reclamation, operation, and maintenance of this Project will be instructed, to a degree appropriate to their involvement in the Project, by the Proponent, with BLM assistance, on historic properties avoidance and protection measures and the laws and regulations protecting cultural resources prior to being authorized to work in the Project Area. Training will include sensitivity training regarding properties of traditional religious and cultural importance to Native American tribes and tribal issues in general. The Proponent will provide for a Spanish speaker to conduct the training in Spanish as needed for native Spanish-speaking personnel. At a minimum, all personnel shall receive a written information sheet(s) that discusses the importance of cultural resources and archaeological laws, including penalties for violation. Personnel who routinely work in the field will be required to receive in-person training that

discusses the importance of cultural resources, including linear resources such as historic trails; laws and regulations protecting them, including ARPA (16 USC 470) and Wyoming Statute §36-1-115; and penalties for violation. This training program will also apply to personnel hired after the Project has started. The Proponent shall maintain records demonstrating that the above-described personnel training has been conducted and that all field workers have received the training.

2. The cultural resources awareness training program will be developed by the Proponent, through their cultural resources contractor, with Consulting Parties to this PA invited and encouraged to participate in its development. The Proponent, through their cultural resources contractor, shall coordinate conference calls with the Consulting Parties to work on development of the training materials. Prior to implementing the training program, the Proponent, through their cultural resources contractor, will provide their cultural resource training materials to the BLM for a 30-day review. During that review period, the BLM will request a 15-day review from Consulting Parties. If any revisions are necessary based on BLM or Consulting Party comments, the Proponent, through their cultural resources contractor, will provide the BLM with an additional 15-day review for the revised training materials.

3. The purpose of the training is to educate all personnel on the laws and regulations protecting cultural resources as well as increase awareness of tribal issues. The goals are to increase respect of archaeology, history, and native cultures and reduce incidents of artifact theft or site vandalism.

D. Confidentiality of Cultural Resource Data

1. To the extent consistent with the NHPA, Section 304, and the ARPA, Section 9(a), and other applicable laws and executive orders, cultural resources data from this Undertaking will be treated as confidential by all Consulting Parties and is not to be released to any person, organization, or agency not a Consulting Party to this PA. Confidentiality concerns for properties that have traditional religious and cultural significance to the Native American tribes will be respected and will remain confidential to the fullest extent permitted by law. The BLM may deny data requests or may require data sharing agreements with any Consulting Party to this PA who is interested in obtaining specific confidential information.

2. Although the BLM will maintain confidentiality of sensitive information about properties that have traditional religious and cultural significance to the Native American tribes to the full extent permitted by law, such information may still be subject to release under court order. Therefore, Native American tribes are encouraged to maintain this information themselves and to provide non-sensitive summaries of this information to the BLM for use in making appropriate decisions.

E. All timelines throughout the PA are in calendar days except where otherwise noted.

II. AREA OF POTENTIAL EFFECT (APE)

A. Defining the APE

The BLM, in consultation with the SHPO and other Consulting Parties, has defined and documented the APE based on direct, indirect, and cumulative effects. The APE is a combination of the areas of direct, indirect, and cumulative effects. The APE will apply to federal, state, and private lands that may be affected by the pipeline corridor, staging areas, access roads, borrow areas, and other related infrastructure for this Undertaking. The BLM may modify the APE in accordance with Stipulation II.B of this PA. The APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking (36 CFR 800.16[d])."

1. Direct Effects

The area of direct effects within the APE is the area within which historic properties may sustain physical alteration or destruction as a result of the Undertaking. The area of direct effects is influenced by the area of potential ground disturbance from activities related to the Undertaking, and will be determined as follows.

a. For pipeline construction, the area of direct effects is 300 feet (150 feet on either side of the ROW centerline). The area of direct effects excludes overlap with adjacent private property where access has been denied and no surface disturbance is allowed. Where the pipeline will be less than 150 feet from paralleling adjacent existing utilities, the area of direct effects will extend 300 feet from the existing utility rather than being centered on the proposed RRNP centerline.

b. For any access roads not within the pipeline construction area of direct effects, the area of direct effects is 100 feet (50 feet on either side of access road centerlines).

c. For any other facilities associated with the Project and outside the pipeline ROW, the area of direct effects is the footprint of the facility plus a 200-foot buffer.

2. Indirect Effects

The area of indirect effects on historic properties within the APE considers visual, audible, and atmospheric elements that could diminish the integrity of historic properties for which setting, feeling, and/or association are aspects of such integrity.

a. The area of indirect effects within the APE for the Undertaking, except for those cases listed below, is 1.0 mile (0.5 mile on either side of the construction centerline).

b. For project facilities that have a vertical component, such as the power line to the Sweetening Plant and the Sweetening Plant itself, the area of indirect effects will be determined using the

methods outlined in Appendix C of the 2014 Wyoming State Protocol (http://www.blm.gov/wy/st/en/programs/Cultural_Resources/protocol.html) but is not expected to exceed 5 miles on either side of the centerline or facility.

c. For NHTs, the area of indirect effects is a radius of 3 miles from any NHT crossing or 3 miles from any NHT.

d. For the Parting of the Ways on the Oregon and California NHTs, the area of indirect effects is a radius of 4 miles from this location.

e. The BLM will consider tribal preference in the reasonable definition of an area of indirect effects concerning the discovery of human remains. Tribal identification and BLM definition of these areas of indirect effects concerning the discovery of human remains will be handled as described in Appendix B, the Monitoring and Discovery Plan.

3. Cumulative Effects

Cumulative effects are the impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes other actions. For the purposes of this PA, the area of cumulative effects is the same as that for direct and indirect effects.

B. Modifying the APE

1. The APE, as currently defined, encompasses an area sufficient to accommodate all of the Undertaking components under consideration as of the date of the execution of this PA. The APE may be modified when tribal consultation, additional field research or literature review, consultation with Consulting Parties, or other factors indicate that the qualities and values of historic properties that lie outside the boundaries of the currently defined APE may be affected directly, indirectly, or cumulatively.

a. If the BLM determines that the Undertaking or changes to the Undertaking may cause direct, indirect, or cumulative effects on historic properties beyond the extent of the established APE that were not foreseeable at the time the PA was executed, then the BLM may use the process set forth in Stipulation II.B.1.b to determine whether to modify the APE.

b. Any Consulting Party to this PA may propose that the APE be modified by providing written justification and illustration of the proposed APE modification. The BLM shall send the modification proposal to all Consulting Parties and consult with them for no more than 30 days in an effort to reach consensus on the proposal. If the Signatories and Invited Signatories agree to modify the APE, the BLM will notify the Consulting Parties of the decision. If all Signatories and Invited Signatories cannot agree to a proposal for the modification of the APE, then the BLM will consider their concerns and will render a final decision after discussion with the SHPO.

2. Agreement to modify the APE will not require an amendment to the PA.

3. Amendment of the ROW grant during construction is considered to result in a change to the APE as covered under Stipulations II.B and X of the PA. Amendment of the ROW grant for operations, maintenance, or decommissioning of the facilities will be considered a separate Undertaking under Section 106.

4. For minor changes to the APE as a result of minor changes during construction, the process outlined in Stipulation X.A will be followed.

III. IDENTIFICATION, EVALUATION, AND FINDING OF EFFECTS

A. Identification of Historic Properties per 36 CFR § 800.4

1. Literature Review: A literature review of federal and state agency files has been completed for a 1.0-mile corridor along all alternatives of the proposed Undertaking. The literature review will inform all subsequent phases and will be used as a reference document to support the Class III surveys conducted for this Undertaking. The BLM will ensure that additional file searches are conducted as needed to address changes in the APE and to be current in advance of any additional Class III inventories.

2. Pre-Construction Class III Inventory

a. Any part of the area of direct effects not already inventoried to current standards or considered by the BLM and the SHPO to be adequately inventoried shall be completely inventoried at a Class III level to Wyoming BLM and SHPO standards; and eligibility, effect, and possible treatment shall be determined by the BLM in consultation with the SHPO and appropriate Consulting Parties, including tribes. Identification efforts shall be performed regardless of the ownership (public or private) of the lands and the Proponent shall be responsible for gaining access to non-BLM lands. Invited Signatory Tribes will be given the opportunity to participate in remaining Class III inventories to assist with identifying cultural resources of concern to tribes, with two tribal participants assigned to each survey crew.

b. The Proponent, through their cultural resources contractor, will use existing resources (including a Wyoming Cultural Records Office file search and the BLM cultural resource records; aerial photographs; General Land Office records; the BLM land records; resource management plans; Project-specific NEPA documents of the proposed Project Area; and information sought and obtained from the SHPO, from Consulting Parties, and the public) to identify cultural resources that may qualify as eligible under Criteria A, B, and/or C that fall within the area of indirect effects and that may be affected by the Undertaking, as described in Appendix C of the Wyoming Protocol.

c. Within 60 days of the signing of the BLM ROD, the Consulting Parties will identify to the BLM areas of concern within the areas of direct and indirect effects. In addition, Consulting Parties may identify specific resources outside the 0.5-mile area of indirect effects on either side of the centerline, with justification for why that resource should be considered for evaluation. The BLM will decide whether the resources identified in this manner should be included in the Proponent's identification of cultural resources within the area of indirect effects in Stipulation

II.B.2.b. Each Consulting Party will also convey to the BLM how they would like to be kept informed of discoveries in their area(s) of concern.

d. The Proponent will obtain written agreement from landowners of historic properties on private land that allows access to the area of direct effects for all anticipated Project-related historic preservation work, report preparation, artifact analysis, photographs, etc. The Proponent will make a good faith effort to obtain written agreement from landowners to allow access to cultural resources that may qualify as eligible under Criteria A, B, and/or C that fall within the area of indirect effects and that may be affected by the Undertaking. For private land where access is denied, the Proponent will provide documentation of efforts to obtain access as well as denial of access to the BLM. For private land where access is denied, the Proponent, through their cultural resources contractor, will use Geographic Information System (GIS) data, aerial photographs, or other methods to determine to the best of their abilities whether cultural resources that may qualify as eligible under Criteria A, B, and/or C will be affected by the Undertaking. GIS data may be used to screen the number of cultural resources that may need to be visited on the ground in the area of indirect effects.

e. The BLM has notified the SHPO that the Proponent, through their cultural resources contractor, will be submitting the Class III inventory reports in segments that correspond with the construction schedule, as allowed in Stipulation III.B.iv of the Wyoming Protocol.

B. Determination of Eligibility and Finding of Effect per 36 CFR § 800.5

1. For each cultural resource within the area of direct effects, the BLM shall consult with any Native American tribe that attaches religious and cultural significance to any identified resource, and other Consulting Parties to determine NRHP eligibility pursuant to 36 CFR 800.4(c)(1) following NRHP guidance in *How to Apply the National Register Criteria for Evaluation.* If the Consulting Parties cannot reach concurrence on a determination of NRHP eligibility, the documentation will be forwarded to the Keeper of the National Register (Keeper) for a formal determination. If the Consulting Parties cannot reach concurrence on other determinations or findings, the question will be referred to the ACHP.

2. All cultural resources found within the area of direct effects shall be evaluated for inclusion on the NRHP under all four criteria and, where appropriate, for Native American religious and cultural significance in consultation with Consulting Party tribes.

3. The Proponent, through their cultural resources contractor, will use the guidance in Appendix C of the Wyoming Protocol to assess effects of the Undertaking on historic properties in the area of indirect effects.

4. The BLM shall determine the effects to historic properties identified in the APE in consultation with the SHPO and Consulting Parties, including tribes.

5. Consultation with SHPO: The BLM will provide each Class III inventory report to the SHPO for a 30-day review and will request concurrence regarding determination of eligibility and finding of effect for all cultural resources whether on federal, state, or private lands. These findings of effect will serve as the basis for the development of the applicable Treatment Plan.

The BLM will have 10 days to respond to any SHPO comments. If the SHPO does not respond within the stated timeframe, the BLM will assume SHPO has no objection to the report and concurs with the agency determination of eligibility and finding of effect. If the 30-day review time frame cannot be met, the SHPO will notify the lead BLM Office main point of contact by e-mail requesting a review extension. The lead BLM Office will determine whether to grant an extension, not to exceed an additional 30 days.

6. After SHPO concurrence on the Class III inventory reports, the Proponent, through their cultural resources contractor, will provide to the BLM a summary document containing a brief description, determination of eligibility, and finding of effect for each site. The document will be consistent with confidentiality provisions of 36 CFR 800.11(c). The BLM will distribute the summary document to Consulting Parties. The BLM will send copies of Class III inventory reports to Native American tribes, through their Tribal Historic Preservation Officer or tribal cultural resources representatives, who sign this PA or a data-sharing agreement consistent with BLM Handbook H-8120-1, Part IV.E.

IV. RESOLUTION OF ADVERSE EFFECTS

A. Avoidance

1. The BLM shall make a good faith effort to avoid adverse effects to historic properties, in consultation with the Proponent, through project design, or redesign, relocation of facilities, or by other means in a manner consistent with this PA. Complete avoidance may not be possible in narrow portions of the ROW.

2. The Proponent shall make a good faith effort to ensure avoidance by all construction personnel and vehicles of all known or identified historic properties considered by federally recognized tribes to be of religious and cultural significance by all construction personnel and vehicles.

3. The Proponent shall endeavor to employ boring under the NHT and to site infrastructure behind landscape features, along with other means as appropriate, to avoid adverse effects to NHTs.

4. Avoidance efforts may result in a finding of “No Effect” or “No Adverse Effect” rather than “Adverse Effect”. In order for BLM and the SHPO to consult on findings of “No Effect” or “No Adverse Effect” based on avoidance efforts, the Proponent, through their cultural resources contractor, will ensure that a description of these proposed efforts are included for each applicable site in the Class III inventory report and in the applicable Treatment Plan.

B. Minimization of Adverse Effects

1. When complete avoidance of adverse effects to historic properties is not possible, the Proponent shall make a good faith effort to minimize adverse effects by using minimization efforts which may include fencing or barricading that protects sites, or portions of sites, from construction disturbance, minimizing the visual effects of the Project by using appropriate paint colors for facilities, and by matching the alignment of facilities with the lines in the landscape, or other efforts designed to minimize any adverse effects to sites.

2. Minimization efforts may result in a finding of "No Adverse Effect" rather than "Adverse Effect." In order to for the BLM and the SHPO to consult on findings of "No Adverse Effect" based on minimization efforts, the Proponent, through their cultural resources contractor, will ensure that a description of these proposed efforts are included for each applicable site in the Class III inventory report and in the applicable Treatment Plan.

C. Mitigation of Adverse Effects

When avoidance and minimization efforts do not completely resolve adverse effects, the BLM, in consultation with the Proponent, SHPO, and Consulting Parties, including tribes, shall ensure that a Treatment Plan is developed and implemented to mitigate Project-related effects on historic properties. A Treatment Plan may be developed and implemented for each segment to reflect the segmentation of the Undertaking, as described in Stipulation III.A.2.e. Upon review by the Consulting Parties and acceptance by the BLM and the SHPO, each Treatment Plan shall be appended to this PA. The Proponent shall procure all appropriate BLM permits prior to the initiation of any treatment.

1. The Treatment Plans will be consistent with the Secretary of the Interior's Standards for Archeology and Historic Preservation (48 FR 44716) (*Federal Register*, September 29, 1983), hereinafter referred to as Secretary's Standards; the ACHP's Section 106 Archaeology Guidance (2009); and all applicable NPS guidance for evaluating and documenting National Register properties (e.g., *Guidelines for Evaluating and Documenting Traditional Cultural Properties*, *Guidelines for Evaluating and Documenting Rural Historic Landscapes*); and State of Wyoming guidelines.

2. The Treatment Plans will include mitigation measures developed through the efforts of all Consulting Parties that address adverse effects on all historic properties that are adversely affected.

3. The Treatment Plans will include mitigation measures that address adverse effects on NHTs. Mitigation measures should be commensurate to the level of adverse impact inflicted on the NHT. Mitigation consisting of journal articles, site visits, brochures, and so on may not be commensurate to the impacts. Landscape restoration (e.g., by removal of unused or abandoned facilities) or revegetation along the NHT, even if outside the APE, may be appropriate in some cases. Other more extensive types of mitigation will be considered as appropriate.

4. The Treatment Plans will include mitigation measures that address public outreach as appropriate, such as journal articles, public site visits, brochures, or web sites focusing on the results of the Project.

5. The Treatment Plans may include mitigation measures that focus on benefit to tribes through public outreach or other means.

6. The Treatment Plans will include mitigation measures for adverse cumulative effects. Such measures may include the kinds of mitigation measures described in Stipulations IV.C.3, 4, and

5. Mitigation measures for adverse cumulative effects will be explicitly identified as such in the Treatment Plans.

7. The Treatment Plans will list all identified historic properties within the APE by land ownership; by township, range, and section number; and by milepost of the Undertaking in which it occurs. Locational information for historic properties shall be included as an appendix that can be redacted for the version of the Treatment Plan available to the general public. The plan will identify the specific avoidance, minimization, and/or mitigation strategies proposed to address the direct, indirect, and cumulative adverse effects of the Undertaking on historic properties.

8. The Treatment Plans will provide a table listing each historic property, including:

a. The site number and name of the historic property;

b. A brief description of the historic property;

c. Its sequential location in terms of distance and direction from a Project-defined milepost(s) or similar established markers;

d. The type of disturbance that will affect the historic property;

e. The nature or kind of each required treatment measure (avoidance, minimization, mitigation) pertaining to each historic property (e.g., landscape photography, archaeological data recovery, etc.);

f. The identification of treatment measures, if any, which must be completed prior to authorization of ground-disturbing activities (e.g., barricading or fencing, archaeological data recovery, landscape photography) and/or those measures which may be completed after authorization of ground disturbance (e.g., historical research, installation of an interpretive kiosk, public education materials, etc.); and

g. The documentation and reporting procedures for each proposed treatment measure.

9. Review and Approval of the Treatment Plans

a. The Proponent will submit a draft Treatment Plan outline to the BLM. The BLM will consult with Consulting Parties to determine Treatment Plan content.

b. Once the BLM has accepted a draft Treatment Plan as prepared by the Proponent, through their cultural resources contractor, the BLM will distribute it to the Consulting Parties, Native American tribes, and SHPO for a 30-day review. Consulting Parties, Native American tribes, and the SHPO will submit comments to the BLM. Consulting Parties may request an extension, not to exceed an additional 10 days.

c. The BLM will take all comments into account in a 10-day review and direct the Proponent, through their cultural resources contractor, to revise the Treatment Plan, as appropriate. The

Proponent, through their cultural resources contractor, will revise and provide the final Treatment Plan to the BLM within 10 days. The BLM will ensure that the appropriate changes have been made and will submit the final Treatment Plan to the SHPO for a 10-day review and concurrence. The SHPO may request an extension of the final review period, not to exceed an additional 10 days.

V. RIGHT-OF-WAY (ROW) MONITORING AND OPEN TRENCH INSPECTION (OTI)

A. The Proponent, through their cultural resources contractor, shall monitor selected segments of the ROW during construction activities (i.e., blading/scraping) prior to pipeline trenching. Discoveries located during monitoring will be handled according to Appendix B. Monitoring locations will include all areas identified in the Treatment Plan. Monitoring procedures, evaluation of NRHP eligibility, tribal consultation, and treatment of discovered historic properties shall be handled in accordance with Appendix B.

B. The Proponent, through their cultural resources contractor, shall conduct OTI of the entire pipeline ROW after trenching and prior to installation of the pipe in the trench. Discoveries located during OTI will be handled according to Appendix B. Any sites determined by the BLM to be historic properties that were adversely affected during construction and not subjected to pre-construction treatment will be addressed in accordance with Appendix B.

C. The Proponent agrees to provide for two qualified Tribal Monitors assigned to each monitoring crew. The two qualified Tribal Monitors will represent all tribes who are Invited Signatories to the PA and who have not declined to consult on the PA.

D. Roles and responsibilities of the Proponent, the Proponent's cultural resources contractor, the BLM, and the tribal monitors, including those pertaining to the determination of eligibility and effects of discoveries, are described in Appendix B.

VI. DISCOVERIES

A. Cultural Resources. All discoveries made during ROW construction or OTI shall be addressed in accordance with Appendix B.

B. Human Remains

1. The BLM and Proponent shall ensure that in the event human remains are discovered during the construction activities, work within 300 feet of the discovery will cease and the area will be secured; the Proponent will immediately contact the BLM authorized officer. The BLM will notify the appropriate County Sheriff's office and Coroner's office as outlined in Appendix B.

2. The BLM and the Proponent shall ensure that any human remains, funerary objects, items of cultural patrimony, or sacred objects encountered during any construction activities are treated with the respect due such materials. Native American human remains and associated grave offerings found on federal land will be handled according to the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) and its implementing regulations (43 CFR § 10), and consistent with Appendix B. Native American human remains found on state

or private land will be handled in accordance with Wyoming Statute §7-4-104 and Appendix B, if the county coroner determines that the discovery does not constitute a modern coroner case as defined by Wyoming Statute 7-4-10(i)(A-H) and releases it. Non-Native American human remains found on federal, state, or private land also will be treated in accordance with Appendix B.

VII. ONGOING TRIBAL CONSULTATION AND COORDINATION

A. Tribal consultation shall continue throughout the proposed Project. The BLM will invite Consulting Party tribes to participate in development of any Treatment Plans for historic properties of religious and/or cultural significance to the tribes. The BLM will respect confidentiality concerns for properties that have traditional religious and cultural significance to the Native American tribes and will maintain such information as confidential to the fullest extent permitted by law.

B. The BLM shall coordinate with the Consulting Party tribes to visit sites of potential tribal interest; the BLM shall consider additional sites identified by participating tribes herein for further coordination and consultation, including but not limited to site visits by tribal representatives to evaluate eligibility, determine effect, and share tribal knowledge regarding sites of cultural and religious importance.

C. The BLM shall continue to coordinate with the Consulting Party tribes for tribal site visits to sites that are recommended for data recovery, prior to initiating data recovery activities.

D. When appropriate, the BLM shall continue to coordinate with the Consulting Party tribes to schedule face-to-face, government-to-government meetings with authorized tribal representatives.

VIII. REPORTING

A. The Proponent, through their cultural resources contractor, shall provide monthly email updates on the status of cultural resources fieldwork and the implementation of the Treatment Plans to the BLM, SHPO, and Consulting Parties, including tribes.

B. The Proponent, through their cultural resources contractor, shall provide draft Project reports including the pre- and post-construction data recovery reports to the BLM for review. The BLM will provide comments on the draft reports. The Proponent, through their cultural resources contractor, shall address the BLM's comments in subsequent drafts until the BLM finds that the reports meet the requirements of the PA.

C. The Proponent, through their cultural resources contractor, shall submit final project reports including the pre- and post-construction data recovery reports to the BLM for review and acceptance no later than 3 years following the completion of post-construction data recovery fieldwork. The BLM shall submit one copy of each final report to the SHPO.

D. All cultural resource inventory reports and documentation will meet the Secretary of the Interior's Standards for Archaeology and Historic preservation (48 CFR 44716-42) and

SHPO standards as set in the version of the *Format, Guidelines, and Standards for Class II and III Reports* that is the most current at the time the inventory reports and documentation are prepared.

E. The BLM Wyoming Rock Springs Field Office is the lead BLM office to which the Proponent, through their cultural resources contractor, shall submit cultural resources reports and from which cultural resources reports shall be distributed for review or compliance.

F. The Proponent shall notify the BLM in writing should additional time be necessary to produce final project reports. Following notification, the BLM shall consult with the SHPO and the Proponent to mutually agree upon a new completion date for the final report.

IX. INITIATION OF CONSTRUCTION ACTIVITIES

The BLM may issue an NTP for segments of the Undertaking only after issuance of all applicable Authorizations for the Undertaking.

A. NTPs for segments may be authorized if the BLM, in consultation with the SHPO pursuant to Stipulation III, determines that:

1. No historic properties are present within the APE for that segment; or

2. Historic properties are present within the APE for that segment but will not be adversely affected, and all stipulations in the Treatment Plan are in place to ensure no adverse effect. Such measures include a buffer for avoidance clearly marked in the field and provision for any monitoring required.

B. If the BLM, in consultation with the SHPO, determines that historic properties are present within the APE for a segment and that such historic properties may be adversely affected by the Undertaking, then the land managing agency may issue an NTP for that segment only if:

1. Implementation of the pre-construction portions of the Treatment Plan for historic properties within the segment is complete and the BLM has received and accepted a preliminary or letter report documenting compliance with the applicable provisions of the Treatment Plan; or

2. The Treatment Plan for historic properties within the segment is implemented to a level acceptable to the BLM, in consultation with the Consulting Parties, and mitigation measures are agreed upon and completed to an acceptable level pursuant to Stipulation IV.C.

X. CHANGES IN CONSTRUCTION ACTIVITIES

A. The BLM will require that a Class III inventory be conducted for any variances or amendments to the ROW grant or any other changes to the Undertaking that are outside the currently inventoried APE (including changes in construction ROW and ancillary areas). Where the BLM determines that additional inventory is needed, no ground disturbance will be authorized in the area of the variance or amendment to the ROW grant or any other changes to the Undertaking until the inventory, the determinations of eligibility, the findings of effect, and

any required on-site mitigation measures are completed. The BLM will issue an NTP after Section 106 requirements are fulfilled for the added area. The BLM will determine where construction may continue while the additional work is being completed.

1. The BLM will notify Consulting Parties within 5 days of changes in construction that fall outside the originally defined APE. Consulting Parties may respond to the BLM within 5 days with comments or concerns. The BLM will consider any comments or concerns when the proposed construction change is processed.

2. After construction is completed, the Proponent, through their cultural resources contractor, will assemble all variance reports into a supplemental inventory volume and append it to the original Class III inventory report for the appropriate segment of the Undertaking.

3. The process for considering changes to the APE for reasons other than minor changes needed during construction is outlined in Stipulation II.B.

B. The BLM and SHPO will diligently work to expedite review of any changes to construction plans after initiation of construction. If the Proponent proposes changes in the construction ROW or any ancillary areas outside of the APE surveyed for the Undertaking, the Proponent, through their cultural resources contractor, will conduct identification and evaluation of historic properties in accordance with Stipulation III. Results of the inventory report will be handled as follows:

1. If the inventory results in no cultural resources identified, the Proponent, through their cultural resources contractor, will submit copies of the draft inventory report to the BLM for distribution to the appropriate federal agencies for review. The agencies will have 5 business days to provide comments on the report to the BLM. If the BLM accepts the findings, the BLM may issue the NTP without formal SHPO review. The BLM will submit the report to SHPO and the Undertaking may proceed. If the BLM does not accept the findings, the Proponent, through their cultural resources contractor, will revise the report as necessary and resubmit it to the BLM within 5 days. The report data will be included in any final report for the Undertaking.

2. If the inventory results in no historic properties identified, the Proponent, through their cultural resources contractor, will submit copies of the draft inventory report to the BLM for distribution to the appropriate Consulting Parties to this PA. Reviewers will provide any comments to the BLM within 10 days of receipt of the document. Any necessary changes to the report will be made by the Proponent, through their cultural resources contractor, and resubmitted to the BLM within 5 days. The BLM will then send the documentation to the SHPO who will have 15 days to review and comment. The BLM will have 5 days to respond to any SHPO comments. If the SHPO does not respond within the stated timeframe, the BLM will assume SHPO has no objection to the report and concurs with the agency determination of eligibility. The BLM may issue the NTP or other applicable authorization to proceed at this point pursuant to Stipulation IX.

3. If the inventory results in historic properties identified, the Proponent, through their cultural resources contractor, will submit copies of the draft inventory report, including the potential effects to any historic properties, to the BLM to distribute to the appropriate Consulting Parties

to this PA. Reviewers will provide any comments to the BLM within 15 days. The Proponent, through their cultural resources contractor, will revise the report and resubmit it to the BLM. The BLM will then send the documentation to the SHPO who will have 15 days to review and comment. The BLM will have 5 days to respond to any SHPO comments. If the SHPO does not respond within the stated timeframe, the BLM will assume SHPO has no objection to the report and concurs with the agency determination of eligibility and finding of effect.

a. No Adverse Effect determination: The BLM may issue the NTP or other applicable authorization to proceed pursuant to Stipulation IX.A.2.

b. Adverse Effect determination: The BLM may issue the NTP or other application for authorization to proceed pursuant to Stipulation IX.B.

XI. PROPONENT'S RESPONSIBILITIES

A. The Proponent will post a financial security (such as a surety bond, letter of credit, etc.) with the BLM in an amount sufficient to cover all post-fieldwork costs associated with implementing the Treatment Plans, or other treatment activities, as negotiated by the Proponent where they contract for services in support of this PA. Such costs may include, but are not limited to treatment; unanticipated discoveries; post-field analyses; research and report preparation; interim and summary reports preparation; the curation of Project documentation and artifact collections in a BLM-approved curation facility; and the repatriation and reburial of any human remains, sacred objects, or objects of cultural patrimony. The Proponent will post a financial security prior to the BLM issuing an NTP for the segment where historic property treatment is required.

B. The security posted is subject to forfeiture if the Proponent does not complete tasks required by this PA within the time period established by the treatment selected; provided, however, that the BLM and Proponent may agree to extend any such time periods. The BLM will notify the Proponent that the security is subject to forfeiture and will allow the Proponent 15 days to respond before action is taken to forfeit the security.

C. The BLM will release the financial security, in whole or in part, as specific tasks required by this PA are completed and accepted by the BLM.

D. The BLM shall track compliance with this PA. Should the Proponent or its cultural resources contractor fail to comply with any provision of this PA, the BLM may, at its discretion, counsel the Proponent and/or its cultural resources contractor regarding performance requirements, or suspend the permits under which this PA is executed. Such suspension could, at BLM's discretion, result in the issuance of a "stop work" order for the entire Project if the BLM determines that the severity of the failure to comply warrants it. Work would restart when the problems have been resolved and the BLM issues an NTP.

XII. PA ANNUAL REPORT AND REVIEW

The Proponent, through its cultural resources contractor, shall submit to the BLM an annual letter report of cultural resources activities pertaining to this Undertaking by January 15 of each

year for the duration of this PA. The annual letter report will include an update on Project schedule, status, and any ongoing cultural resources monitoring or mitigation activities, discovery situations, or outstanding tasks to be completed under this PA or the Treatment Plans. The BLM will distribute the annual letter report to Consulting Parties, who will evaluate the implementation and operation of this PA on an annual basis. This evaluation, to be conducted after the receipt of the Proponent's letter report, may include in-person meetings or conference calls among these parties and suggestions for possible modifications or amendments to this PA.

XIII. CURATION

A. Collection of archaeological materials will follow BLM Cultural Resource Use Permit standard permit conditions. All materials found on federal lands will remain federal property when curated, unless otherwise repatriated in accordance with the NAGPRA (25 USC 3001 et seq. [November 16, 1990] and 43 CFR 10).

B. Archaeological materials collected from non-federal lands (including private and state) pursuant to the implementation of this PA shall be maintained in accordance with 36 CFR Part 79 until all analysis is complete. If non-federal landowners wish to donate collections from their lands to a museum, university, historical society, tribe, or other repository, the BLM will ensure the transfer occurs and the Proponent covers the transfer and curation costs. Otherwise, the BLM will ensure that collections from such non-federal lands are returned to the landowners within 60 days of acceptance of the applicable report by the SHPO. The disposition of archaeological materials collected from private land will be formalized with a signed landowner agreement. The Proponent, through its cultural resources contractor, will provide documentation to the BLM and the SHPO of the disposition of non-federal collections.

C. The BLM shall ensure that curation of the material remains and all associated records resulting from identification and data recovery efforts on federal lands is completed in accordance with 36 CFR Part 79. Per Wyoming BLM Cultural Resources Use Permit Conditions Part 3.v, the Proponent, through its cultural resources contractor, shall deposit all material remains and associated records at the University of Wyoming Archaeological Repository no later than 60 days after the date the relevant final report is submitted to the BLM Authorized Officer. Not later than 180 days after the relevant final report is submitted, the Proponent, through its cultural resources contractor, shall provide the BLM Wyoming State Office with a catalog of all materials deposited with the curatorial facility.

XIV. DISPUTE RESOLUTION

A. Should any Signatory or Invited Signatory to this PA provide notice to the BLM of its objection to an action under this PA, or implementation of the measures stipulated in this PA, within 30 days of becoming aware of an action, the BLM shall consult with the Consulting Parties to this PA to resolve the objection, unless otherwise specified in this document. If the BLM determines that the objection cannot be resolved, the BLM will forward all documentation relevant to the dispute to the ACHP, per 36 CFR Part 800.5(c)(2) and Appendix A, including the BLM's proposed resolution. The objecting party must provide reasons for, and a justification of, its objection at the time it initially submits its objection to the BLM. Within 30 days after receipt of all pertinent documentation, the ACHP shall either:

1. Provide the BLM with recommendations, which the BLM shall take into account in reaching a final decision regarding the dispute;

2. Notify the BLM that it will comment within an additional 30 days. Any ACHP comment provided in response to such a request will be taken into account, and responded to by the BLM with reference to the subject of the dispute; or

3. Notify the BLM that it will not comment, in which case the BLM may proceed with a final decision regarding the dispute.

If the BLM receives no response from the ACHP within the allotted timeframe, the BLM may proceed with a final decision regarding the dispute.

B. The BLM responsibility to carry out all actions under this PA that are not the subject of the dispute will remain unchanged.

XV. AMENDMENT

Any Signatory or Invited Signatory to this agreement may request that the other Consulting Parties consider amending the agreement if circumstances change over time and warrant revision of the stipulations of the agreement. During the amendment process, the Parties may identify specific sections and/or appendices that are subject to amendment. Amendments shall be executed in writing and shall be signed by all Consulting Parties in the same manner as the original PA.

XVI. TERMINATION

A. Any Signatory or Invited Signatory to this PA may seek termination by providing written notice to the other Signatories of their intent. After notification by the initiating party, the remaining Signatories and Invited Signatories shall have 30 business days to consult to seek agreement on amendments or any other actions that would address the issues and avoid termination.

B. In the event that this PA is terminated, the BLM shall comply with 36 CFR 800.6 (c)(8) and will take reasonable steps to avoid adverse effects on historic properties until another PA has been executed or will request, take into account, and respond to ACHP comments, in accordance with 36 CFR 800.7. The BLM will notify all parties to this agreement as to the course of action it will pursue.

XVII. SUNSET TERMS

A. This PA shall remain in effect until all requirements have been completed, but for no longer than 10 years after the date of execution hereof unless an extension is agreed to by all Signatories.

B. If the Proponent has not completed the agreed upon mitigation within 10 years from the date of PA execution, a PA review will be required. All Signatories will be consulted in the reevaluation of the stipulations.

XVIII. GENERAL PROVISIONS

A. **Entirety of Agreement.** This PA, consisting of 41 pages, represents the entire and integrated agreement between the Parties and supersedes all prior negotiations, representations, and agreements, whether written or oral, regarding compliance with Section 106 of the NHPA regarding this Undertaking.

B. **Prior Approval.** This PA shall not be binding upon any party unless this PA has been reduced to writing before performance begins as described under the terms of this PA, and unless the PA is approved as to form by the Wyoming Attorney General or his representative.

C. **Severability.** Should any portion of this PA be judicially determined to be illegal or unenforceable, the remainder of the PA shall continue in full force and effect, and any party may renegotiate the terms affected by the severance.

D. **Sovereign Immunity**. The State of Wyoming, the SHPO, and the tribes do not waive their sovereign or governmental immunity by entering into this PA and each fully retains all immunities and defenses provided by law with respect to any action based on or occurring as a result of the PA.

E. **Indemnification.** Each Signatory to this PA shall assume the risk of any liability arising from its own conduct. Each Signatory agrees they are not obligated to insure, defend, or indemnify the other Signatories to this PA.

Execution of this PA and implementation of its terms evidence that the BLM has taken into account the effects of the Undertaking on historic properties.

Signatures. In witness whereof, the Parties to this PA through their duly authorized representatives have executed this PA on the dates set out below, and certify that they have read, understood, and agreed to the terms and conditions of this PA as set forth herein.

The effective date of this PA is the date of the last Signatory signature affixed to these pages.

SIGNATORIES

INVITED SIGNATORIES

CONCURRING PARTIES

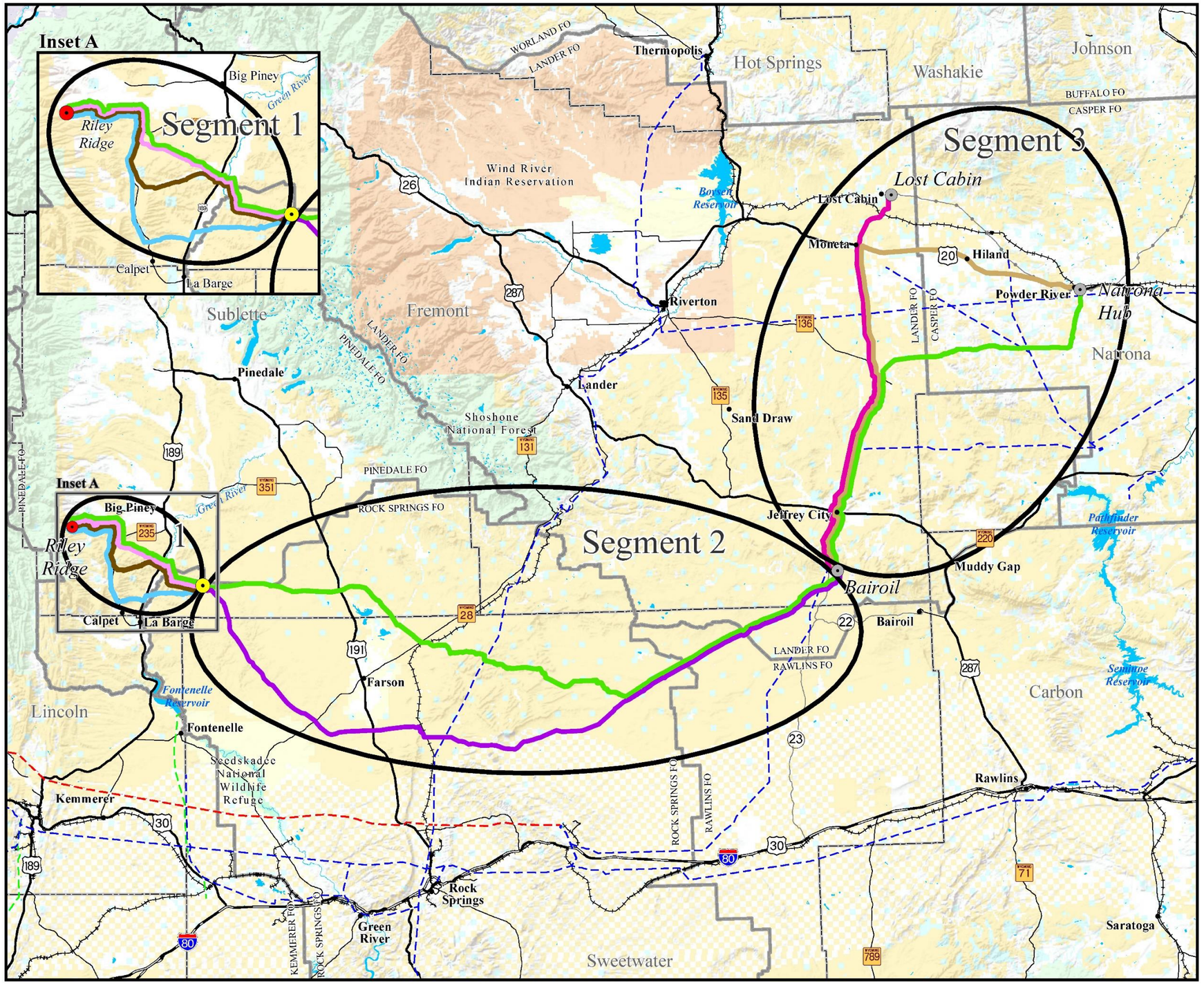
LIST OF APPENDICES

Appendix A – Map of Proposed Route and Alternatives

Appendix B – Monitoring and Discovery Plan

Appendix C – Historic Properties Treatment Plans (As Completed)

APPENDIX A:
MAP OF PROPOSED ROUTE AND ALTERNATIVES



Map 2-1
Land Ownership and Alternative Routes

RILEY RIDGE TO NATRONA PROJECT

Alternative Routes[1]

Segment 1
- 1A: Proposed Action
- 1A - Variation: Dry Basin Draw
- 1B: Dry Piney
- 1C: Figure 4

Segment 2
- 2A: Proposed Action
- 2B: Southern Route

Segment 3
- 3A: Proposed Action
- 3B: Lost Creek to Lost Cabin
- 3C: Lost Creek to Highway 20/26

Project Features
- Riley Ridge Treatment Plant
- Interconnect
- Proposed Riley Ridge Sweetening Plant

Land Ownership
- Bureau of Land Management
- Bureau of Reclamation
- Indian Reservation
- U.S. Department of Defense
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- State Land
- Private Land

General Reference
- City or Town
- 345kV Transmission Line
- 230kV Transmission Line
- 138kV Transmission Line
- Greencore Pipeline
- Railroad
- Interstate Highway
- U.S. Highway
- State Highway
- Other Road
- Lake or Reservoir
- County Boundary
- BLM Field Office Boundary

SOURCES:
Land Jurisdiction, BLM 2013; City or Town, ESRI 2013;
BLM Field Office Boundary, BLM 2008;
Transmission Lines and Substations as digitized by EPG, POWERmap Platts 2009;
Highways, Roads, and Railroads, ESRI 2013; Greencore Pipeline, SWCA 2015;
Water Features, ESRI 2008, USGS 2010; State and County Boundaries, ESRI 2013

NOTES:
[1] Preliminary route options are graphically depicted on map and, in some cases, share centerline alignment in common areas.

Last Revised: February 19, 2015
Draft EIS: March 2018

0 5 10 20
Miles

APPENDIX B:
MONITORING AND DISCOVERY PLAN

ABSTRACT

Right-of-way monitoring and open trench inspection (OTI) will be conducted by archaeological and tribal monitors during construction of the Riley Ridge to Natrona Project. All open trenches will be inspected for cultural material, and select areas will be subjected to right-of-way monitoring. This appendix to the project Programmatic Agreement details the monitoring plan and the actions to be taken in the event that cultural resources are discovered during monitoring and OTI. Qualifications, training, and responsibilities for archaeological monitors, tribal monitors, and construction-related project personnel are defined. The discovery plan addresses the procedures to be followed in the event of discoveries likely to be made during active blading activities and those made during OTI. This appendix also details the notification and authorization procedures in the event of the discovery of human remains. Lastly, the reporting obligations of the cultural resource contractor are defined as they relate to monitoring, OTI, and associated discoveries.

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

Denbury Green Pipeline – Riley Ridge LLC (Denbury) is proposing to construct the Riley Ridge to Natrona Project (RRNP) in three segments. The Project crosses federal, state, and private lands. The first segment is a 30-mile-long, 16-inch-diameter pipeline for non-gaseous hydrogen sulfide (H_2S)/carbon dioxide (CO_2) that would extend eastward from the existing Riley Ridge Treating Plant west of Big Piney (Sublette County) to the proposed Riley Ridge Sweetening Plant. The proposed Sweetening Plant encompasses 4.2 acres and includes associated facilities (also in Sublette County). The second segment includes an approximately 130-mile-long, 24-inch-diameter pipeline extending from the proposed Sweetening Plant to the Bairoil Valve Site, and the third segment is a 24-inch-diameter pipeline that extends approximately 74 miles from the Bairoil Valve Site to the Lost Cabin Gas Plant. These Project segments will be built using construction "spreads," which are contiguous lengths of construction that are coordinated from initial road improvements and right-of-way (ROW) grading to pipeline delivery, welding, and burial. Depending on the length of the pipeline segment and the available construction timeframe, segments may be built using one or more construction spread. Archaeological monitoring and open trench inspection (OTI) will be organized on a per-spread basis.

Project details are provided in the approved Project Plan of Development. The proposed construction ROW for the RRNP pipeline is 115 feet wide. Additional temporary workspace will be required in several areas, primarily to accommodate extra workspace due to topography, temporary sediment storage, and staging areas. Temporary access roads will be improved for use during construction. Unless recently adequately inventoried (as determined by the Bureau of Land Management [BLM]), all areas of disturbance will be inventoried for cultural resources. Railroad sidings will be used to offload the pipe, and there will be nearby pipe storage areas. Mainline valves will be powered through either power lines or solar panels as is feasible.

Denbury is the project proponent (Proponent). The BLM High Desert District Office is the lead agency working to prepare the environmental impact statement (EIS), pursuant to the National Environmental Policy Act (NEPA). Environmental Planning Group (EPG) is the NEPA contractor assisting the BLM with this document. SWCA Environmental Consultants (SWCA) (cultural resources contractor) is conducting cultural and environmental studies in support of the NEPA process and compliance with Title 54 United States Code (USC) § 306108, commonly known as Section 106 of the National Historic Preservation Act of 1966 (54 USC § 300101 et seq., as amended), hereinafter referred to as Section 106. NEPA requires NHPA Section 106 compliance, and Section 106 requires federal agencies to take into account the effects of their undertakings on historic properties and seek ways to avoid, minimize, or mitigate these effects.

A Programmatic Agreement (PA) has been negotiated to define the terms and conditions for Section 106 compliance prior to, during, and after construction. The PA has three appendices. Appendix A is a map of the proposed route and EIS project alternatives. This current appendix (Appendix B) defines the monitoring and discovery plans during construction per Title 36 Code of Federal Regulations (CFR) Part 800.13, as well as the Native American Graves Protection and Repatriation Act (NAGPRA) plan of action per 25 USC 3001 et seq. (November 16, 1990) and 43 CFR 10. Detailed site-specific Historic Properties Treatment Plans (Treatment Plans) consistent with the Secretary of the Interior's Standards for Archeology and Historic Preservation (48 FR 44716) (*Federal Register*, September 29, 1983) (hereinafter referred to as

Secretary's Standards) will be developed and approved by the PA signatories following the approval of the Class III cultural resources inventory for each Project segment, at which point the Treatment Plans will added to the PA in Appendix C. The PA allows for tribal monitors to participate in the remaining Class III inventory for the Project in a similar fashion to their participation in monitoring and OTI, per PA Stipulation III.A.2.a.

RIGHT-OF-WAY MONITORING AND OPEN TRENCH INSPECTION

The purpose of ROW monitoring and OTI is to systematically identify and treat previously unidentified historic properties and/or resources with potential tribal value during construction. Historic properties are defined as cultural resources that are eligible for nomination to the National Register of Historic Places (NRHP). This procedure applies to known resources as well, where construction may expose material that alters the NRHP-eligibility and/or extent of the significant cultural material.

The BLM will be responsible for providing an on-call BLM archaeologist for each BLM Field Office during regular BLM office hours (7:45 a.m. to 4:30 p.m.) to assist in evaluating discoveries, recommending treatments and further actions, and detailing work plans for NRHP-eligible resources as appropriate. For discoveries made after regular BLM office hours, the Assistant Field Manager or the Field Manager will be the BLM point of contact (POC) for notification of discoveries. The on-call archaeologist will provide contact information for the BLM Field Office front desk, the on-call archaeologist, the back-up archaeologist, the Field Manager, the Assistant Field Manager, and anyone acting in these positions to the cultural resources contractor's lead archaeological monitor, who will disseminate it to all archaeological monitors. A back-up BLM archaeologist for each BLM Field Office will be assigned to the Project in the event that the primary on-call BLM archaeologist is unavailable. The BLM archaeologist must be reachable via office phone and does not necessarily need to be present on site to assist in the discoveries; however, site visits may be appropriate depending on the nature of the discovery and will be decided on a per-discovery basis.

Ground-disturbing activities associated with RRNP construction can result in adverse effects to historic properties that require mitigative treatment measures (36 CFR 800.5). ROW monitoring is therefore conducted during active RRNP construction, typically while the ROW or other areas are being bladed. Due to the nature of trenching, which passes through an area producing abundant amounts of dust and potentially hazardous debris before the disturbance is visible, active monitoring of trenching operations will not be conducted. Rather, the trench and any other excavated trench areas (e.g., safety step backs, trench skips, bore pits, etc.) will be inspected when it is safe to do so after the trenching equipment has left the area.

OTI is conducted after the trench has been excavated but before the pipe is placed in the ground. Both sides of the trench are visually inspected from the surface of the graded ROW in an attempt to identify buried cultural material. Due to Occupational Safety and Health Administration regulations (29 CFR 1926 Subpart P), this inspection cannot typically be conducted from within the trench. OTI will be conducted along all pipeline trenches. OTI discoveries will be evaluated for significance, which may involve limited shovel and/or auger testing. All tests will be excavated in 10-centimeter increments to allow the approximate depths of any cultural material to be estimated. Sediment excavated from these tests will be screened through ¼-inch mesh;

however, 1/8-inch mesh may be warranted given fine sandy deposits or presence of cultural features. All OTI site discoveries will be communicated to the on-call BLM archaeologist (or BLM POC, if after hours) in real time to determine if work can continue within the trench (i.e., pipe lowering and burial).

Potential monitoring areas include all areas slated for blading, with the exception of previously improved and maintained roads that may be maintained during the course of the Project. Unimproved roads or other work areas that will result in new surface disturbance may be subject to monitoring. Heavy machinery redistributing sediment in monitoring areas that have been previously disturbed will not require an archaeological monitor.

Specific monitoring locations will be identified in an attachment(s) to this appendix, which will be developed following approval of the Class III inventory report(s). Monitoring locations include (but will not necessarily be limited to) all areas subjected to grading operations that meet any of the following criteria.

1. Areas within 30 meters of a known eligible site or within 100 meters of a site with stone features of potential Native American concern (e.g., stone circles, cairns, rock piles, alignments, etc.), or within the distance specified as a result of site-specific tribal consultation;
2. Is within an area where protective fencing will be installed around archaeological site avoidance areas;
3. Is within an area of high prehistoric site density that has the potential to yield additional cultural material as determined by the Project archaeologists; or
4. Is within an area with significant aggraded Holocene sediment (e.g., alluvium or aeolian deposits) that could preserve cultural remains with good integrity.

Specific monitoring areas will be defined in an attachment to this Monitoring and Discovery Plan that will be prepared by the cultural resources contractor and subject to BLM review and approval prior to the initiation of construction activities. Locations meeting criteria 1 and 3 will be defined according to Wyoming Cultural Records Office data supplemented by the information presented in the approved Class III inventory report. Criterion 2 locations also will be defined by the approved Class III inventory report and may be modified following additional inventories and/or BLM direction. Areas meeting criterion 4 will be defined first by a desktop review of pertinent data such as soils and surface geology maps, streams, waterbody, and springs data, and aerial imagery by a permitted archaeologist with experience in evaluating depositional potential. Identification will focus on areas broadly identified as exhibiting greater or lesser potential for intact Holocene deposits. These locations will be confirmed and/or modified following a field reconnaissance (by vehicle) of the project area. Additional monitoring locations may be added following input from the BLM archaeologists. Monitoring may be terminated where Holocene deposition is found to be lacking, such as places where construction activity reaches pre-Holocene deposits and/or is no longer occurring in undisturbed Holocene sediment.

When potential historic properties or resources of potential tribal value are encountered during monitoring, the monitor may order construction work to cease in the area until the discovery can be evaluated and treated. This could range from a brief assessment of the nature of potential cultural remains to a prolonged stoppage, depending on the nature of the discovery. If the

remains encountered do not meet the criteria necessary for a cultural site, work may immediately resume on the authority of the archaeological monitor. However, if the discovery is a recordable cultural site (as defined in the BLM Cultural Resource Use Permit), the BLM Field Office archaeologist will be notified. The BLM Field Office archaeologist and the Field Manager will have the sole authority to allow ground-disturbing activities in the area to resume. The archaeological monitor will have authority to resume activities in the vicinity of a recordable isolated resource. Additional detail regarding stop work orders and associated communication protocols is provided in the Discovery Plans and Coordination and Notification sections of this appendix.

With the exception of buried cultural remains with unusual importance, the goal during ROW archaeological monitoring will be to make a brief assessment of the nature of the remains. The lead archaeological monitor will notify the on-call BLM archaeologist immediately regarding the nature of the discovery, and the on-call BLM archaeologist will make a decision regarding further investigations necessary and the resumption of construction activity in the area. Further investigations may include salvage excavations of exposed cultural material, and/or assessing site significance and extent through shovel and/or auger testing as applicable. Examples of cultural material unlikely to result in a prolonged halt to construction include historic debris and isolated occurrences. Examples of cultural remains that may result in a prolonged halt to construction include human remains, an intact house pit, or a dense accumulation of butchered faunal remains.

QUALIFICATIONS, TRAINING, AND RESPONSIBILITIES

ARCHAEOLOGICAL MONITORS

Qualifications and Training

A minimum of one lead archaeological monitor listed on BLM Cultural Resource Use Permits for Survey and Limited Testing and Collection will be provided per monitoring crew. The Project segments will be built using construction "spreads," which are contiguous lengths of construction that are coordinated from initial road improvements and ROW grading to pipeline delivery, welding, and burial. Depending on the length of the pipeline segment and the available construction timeframe, segments may be built using one or more construction spread. Archaeological monitoring and OTI will be organized on a per-spread basis. Within a construction spread, when construction occurs in multiple areas extending beyond 5 miles apart, a minimum of one monitor will be listed on the BLM permit per 5-mile construction area. The lead monitor will report to the lead environmental inspector (EI). This lead monitor will be trained regarding NAGPRA provisions prior to monitoring. Additional subordinate archaeological monitors will be used as needed. These monitors will be under the direct supervision of the lead monitor and will have a Bachelor's Degree or higher in Anthropology/Archaeology and at least 2 years of archaeological experience. No additional formal training will be required. Prior to beginning fieldwork, archaeological personnel will obtain a fieldwork authorization request with the appropriate BLM Field Offices.

Responsibilities

The lead archaeological monitor will coordinate work areas with the lead EI on a daily basis and will assist the BLM archaeologist(s) as requested. The lead archaeological monitor will maintain a log book of monitoring areas to assist in ensuring that all areas needing monitoring/OTI are accounted for. Monitors will attend construction meetings as necessary to coordinate ROW monitoring and OTI efforts with construction personnel and to provide information regarding any construction restrictions caused by discoveries made during monitoring and OTI. Archaeological monitors will work with the heavy equipment operators engaged in blading to ensure that all selected locations are monitored. Two-way radios will be used by monitors to communicate as needed to assist in discoveries and coordinate workload between monitoring locations.

Archaeological monitors will identify, evaluate, and record cultural remains as detailed in the Discovery Plan section of this appendix. Additionally, the archaeological monitors will have stop work authority as needed to halt construction to allow potential cultural remains to be evaluated. The lead archaeological monitor will be in communication with the on-call BLM archaeologist(s) in real time via cell phone, text, and/or email as needed, but specifically for purposes of evaluating the significance of discoveries, the effect of construction, and the further work to be conducted at discovery locations as detailed in the discovery plans. In addition to this real-time communication, the lead archaeological monitor will submit a weekly progress report to the EI and to the BLM archaeologist that provides an overview of monitoring locations, any discoveries, and work conducted at each discovery.

Pursuant to the permit standards, archaeological monitors shall not disclose information regarding the specific location and nature of archaeological resources. Any exclusion fencing, flagging, or signage necessary to ensure avoidance of historic properties will be general in nature and not identify specific archaeological resources. Archaeological monitors will follow Personal Protective Equipment (PPE) requirements set forth by the Proponent. Failure to adhere to the PPE requirements may result in the monitor being removed from the Project.

TRIBAL MONITORS

Qualifications and Schedule

Qualified tribal monitors will accompany archaeological monitors while conducting monitoring and OTI. To be qualified, Tribal Historic Preservation Officers (THPOs) or tribal cultural resources representatives must provide proof of monitor training or comparable permit documents to the cultural resources contractor.

The Proponent agrees to provide for a minimum of two tribal monitor positions per construction spread that can be rotated through each of the participating tribes, but will not be shorter than a 2-week period for each tribal monitor. The BLM will consult with the Invited Signatory tribes regarding how they would like to select the representatives who will serve as the tribal monitors. The BLM will consult with the tribes to seek a list of alternate monitors in case one needs to be replaced at short notice. Through this consultation process, tribal monitors will be scheduled for specific monitoring time periods and construction spreads. Scheduling will be coordinated and

documented through the cultural resources contractor and the THPOs. Daily schedules during work sessions will be disseminated from the lead archaeological monitors to the tribal monitors.

Payment

Discussions of payments will be between THPOs and the Proponent through the Proponent's cultural resources contractor. The BLM will have no financial responsibility in implementing tribal monitoring.

After monitoring services have been provided, payment will be made via check paid directly to the THPO office or to the tribal government office (depending on tribal preference) for distribution to the tribal monitors unless otherwise negotiated between the THPO and the cultural resources contractor. Payment to tribal monitors will be made every 2 weeks at the rotation of tribal monitors. The THPO must notify the cultural resources contractor within 10 calendar days of work if cash payment is needed upon delivery of services.

The cultural resources contractor will be available to assist in coordinating lodging reservations if requested by the THPO but will not be responsible for lodging payment, as this cost is included in the day rate paid to the tribal monitors. The THPO must notify the cultural resources contractor in advance if payment is needed to cover lodging costs paid at time of checkout. In such cases, the cultural resources contractor will provide lodging receipts to the THPO and will deduct this amount from the day rate reimbursement. In the event of a suspension of construction activities the Proponent will be relieved of its obligation to compensate the tribal monitor until construction resumes.

Responsibilities

The lead archaeological monitors will be the POC for the tribal monitors and will assist in matters of day to day business while in the field, informing the monitors on Project processes, progress, and anticipated schedules, and daily work locations. During monitoring activities, tribal monitors will work in tandem with the archaeological monitors.

Tribal monitors must comply with the Proponent's *Health, Safety, and Environmental Guidelines for Contractors*, and any other applicable federal and state regulations. The tribal monitors must also agree to any state requirements imposed via license or permit. Prior to entering the Proponent's construction sites, the tribal monitors shall execute the Proponent's Individual Release and Waiver Agreement. The tribal monitors will be expected to comply with the reasonable requests and instructions of the Proponent's construction manager. All tribal monitors will follow PPE requirements set forth by the Proponent. Failure to adhere to the PPE requirements may result in the monitor being removed from the project.

If issues arise regarding tribal monitor performance or attendance, the cultural resources contractor will contact the THPO and/or BLM POC, depending on the nature of the issue. If tribal monitors are late in attendance as assigned, construction or other Project activities will proceed without the tribal monitor.

The tribal monitors will be allowed to observe construction, assist in cases of discoveries and evaluations, and to ask questions relating to construction activities and receive responses thereto,

but they shall not participate in the construction activities and shall not impede or hinder construction activities. The tribal monitors may share information regarding discoveries with the archaeological monitors, who may suspend construction activities around a potential discovery if warranted by the archaeological monitor.

Monitoring work is stipulated to be limited to areas actively being bladed, and for OTI, this work will be on either side of the open trench. Monitoring will not include locations outside of the area of disturbance. In the event of non-compliance, a tribal monitor shall be required to leave the construction site and the Proponent shall be relieved of any further obligation to permit or compensate the attendance of that particular tribal monitor thereafter. Should a tribal monitor be required to leave the construction site, the Proponent shall be responsible for replacing that tribal monitor as quickly as possible, from the list provided by Invited Signatory tribes at the beginning of construction.

Tribal monitors are encouraged to maintain information about properties that have or may have traditional religious and cultural significance to Native American tribes and provide summaries of this information in a non-sensitive format to the BLM for use in making appropriate decisions.

Tribal monitors will have the opportunity to provide information to the archaeological monitors and the BLM archaeologists regarding cultural resource eligibilities in terms of NRHP criteria and considerations pursuant to 36 CFR § 60.4 and National Park Service (NPS) Bulletin 38. Information will be requested (but not required) from tribal monitors regarding aspects of integrity of historic properties per NPS Bulletin 38, with the understanding that certain aspects of integrity may be confidential to the tribe(s). Final determinations on eligibility will be made pursuant to the PA.

The archaeological monitors will provide global positioning system (GPS)/geographic information system (GIS) support for tribal documentation as needed. Any other field equipment needed will be agreed upon between the THPO and the cultural resources contractor on behalf of the Proponent. Tribal monitors will be expected to supply their own necessary personal gear, and recording and documenting implements (e.g., PPE, first aid kits, notebooks, compass, camera, etc.). All personnel will need to bring their own lunch and water. Reporting obligations for the tribal monitors are detailed in the Reporting section of this appendix.

PROJECT PERSONNEL

Training

As outlined in the PA, the cultural resources contractor will instruct, with BLM and Proponent assistance with training materials, all personnel involved in construction, reclamation, operation, and maintenance (including archaeologists working for the Proponent's cultural resources contractor) regarding site avoidance and protection measures and the laws and regulations regarding the protection of cultural resources prior to being authorized to work in the field on the Project via a cultural resources awareness training. The Proponent will provide for a Spanish speaker to conduct the training in Spanish as needed for native Spanish-speaking personnel. Training will also include sensitivity training regarding properties of potential traditional religious and cultural importance to Native American tribes and tribal issues in general. THPOs and/or tribal representatives will be given the opportunity to assist with this training. At a

minimum, all personnel shall receive an information sheet(s) that discusses the importance of cultural resources and archaeological laws, including penalties for violation. Personnel who routinely work on site will be required to receive in-person training. The goal of this training is to increase respect of cultural resources and native cultures, with the intention of reducing incidents of artifact theft or vandalism. The cultural resources contractor will maintain records demonstrating that the personnel involved in field construction, reclamation, operation, and maintenance have completed cultural resource and tribal sensitivity training. These records will be included in a report to the BLM.

Responsibilities

As detailed in the Discovery Plan section in this appendix, Project personnel will be responsible for notifying the lead EI of potential cultural resource discoveries identified during construction. Project personnel will cease work in the area until it can be visited by an archaeological monitor. The lead EI will notify the lead archaeological monitor of the potential discovery, who will coordinate with archaeological and tribal monitors to evaluate the discovery and proceed as outlined above and detailed in the Discovery Plan section.

DISCOVERY PLAN

All cultural remains over 50 years old identified in the graded ROW or pipeline trench will be formally recorded during monitoring and OTI, with the exception of items listed in Appendix D of the 2014 State Protocol between the BLM and State Historic Preservation Office (SHPO), Exclusions: Defined Non-sites and Property Types Requiring No Formal Documentation (http://www.blm.gov/wy/st/en/programs/Cultural_Resources/protocol.html). Discoveries may be newly identified resources or they may be new discoveries within/adjacent to previously documented cultural sites. All applicable cultural resources documented during monitoring and OTI will be evaluated for NRHP eligibility, which may involve shovel and/or auger tests to evaluate the potential for significant buried deposits. Under the direction of the BLM archaeologist(s), historic properties will be further evaluated for Project effect, which may involve additional shovel and/or auger tests. Reporting obligations for the archaeological monitors are detailed in the Reporting section of this appendix.

The most common discoveries are anticipated to include cultural material similar to what has been documented previously during the Project and adjacent projects to date, such as flaked stone artifacts, thermal features (e.g., hearths or fire pits, fire-altered rock concentrations, and charcoal stains), house pits, and historic debris. Given previous discoveries along paralleling pipelines, it is likely that several buried thermal features and possibly house pits will be among the anticipated discoveries for RRNP.

Procedures to be followed for discoveries made during blading activities are detailed first, followed by OTI discovery procedures. The Discovery of Human and/or NAGPRA-Related Remains section of this appendix details protocols to be followed in the event of these unanticipated discoveries, as these require a unique protocol.

DISCOVERY DURING CONSTRUCTION

The discovery of cultural remains during construction may occur by construction personnel, EIs, BLM personnel, and archaeological and tribal monitors. Archaeological and tribal monitors will actively observe blading in select areas based on the aforementioned criteria. This monitoring will focus on the discovery of cultural material during the blading activities, in an effort to minimize damage and allow for further evaluation. Most commonly anticipated to be thermal features or associated stains and debris, these discoveries may be located during blading for roads, the ROW, workspaces, and facilities. The procedural flowchart for cultural discoveries other than human and/or NAGPRA-related remains is outlined in Figure B.1.

For discoveries that do not include human or NAGPRA-related remains made by construction or other non-archaeological Project-related personnel, construction will be halted within 300 feet of the discovery, and a barricade will be placed at least 20 feet from the discovery in the event that an archaeological monitor is not present or immediately available and the discovery is susceptible to further disturbance. Vehicle traffic will be redirected around the discovery, with the assistance of barricades as applicable to prevent further damage. Any construction or other non-archaeological Project-related personnel who make a discovery will immediately notify their supervisor of the discovery, who will notify the EI. The EI will immediately notify the lead archaeological monitor, and an archaeologist and tribal monitor will assess the discovery as described below.

Archaeological monitors will halt and redirect construction around discoveries, with the assistance of barricades if needed to prevent further damage. An attempt will be made to allow for a work-around if it is possible to redirect traffic without causing further damage to the discovery. The archaeologist will assess the discovery to determine if it is a recordable cultural resource. With the exception of any human remains or items of cultural patrimony, if the discovery is an isolated resource (as defined by the SHPO), the archaeologist will fully record the discovery, authorize construction to resume, and summarize the finding in a weekly report as further described in the Reporting section of this appendix. This authorization and reporting procedure will be the same for discoveries that are found to be either non-cultural or cultural but not meeting the criteria necessary for formal recording (as described above). Human remains or items of cultural patrimony will be addressed as detailed in the section entitled Discovery of Human or NAGPRA-Related Remains.

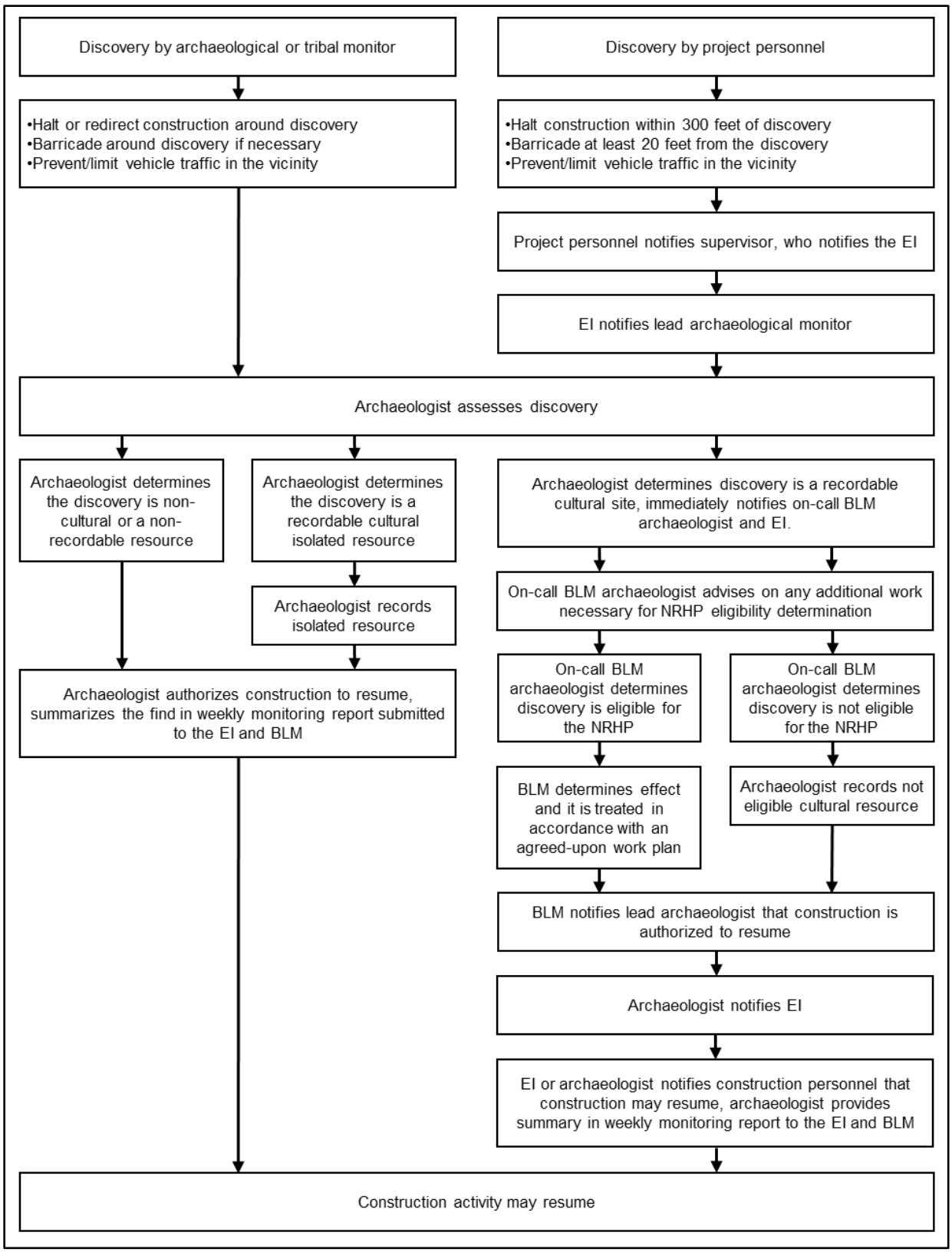


Figure B.1. Flowchart for cultural resource discoveries, excluding human or NAGPRA-related remains.

If the archaeologist determines a discovery is a recordable cultural site (as defined by the SHPO), photographs and basic information regarding the nature of the discovery, its context, and integrity will be recorded, and an on-call BLM archaeologist will be immediately notified, along with the EI. The discovery will be described to the BLM archaeologist, who will advise the archaeologist regarding any additional work necessary to determine NRHP eligibility (e.g., additional photographs, geomorphological assessment, location and number of shovel/auger tests and/or salvage excavations of exposed features, etc.). Shovel/auger tests and salvage excavations will be conducted in 10-centimeter increments, with all sediment screened through ¼-inch or 1/8-inch mesh. Finer mesh may be more appropriate in fine sandy sediment and when screening feature remains. Salvage excavations of exposed features will be excavated using 1- by 1-meter grids as needed to encompass the feature extent.

The results of this additional work will be relayed to the on-call BLM archaeologist for further immediate evaluation. For sites that are found by the BLM archaeologist to be not eligible for NRHP nomination (e.g., isolated simple thermal features, features lacking context or physical integrity, common historic debris, etc.), the BLM will notify the archaeologist that construction may resume. The archaeologist will relay this information to the EI and construction personnel as appropriate.

For sites that are found by the BLM archaeologist to be eligible or likely to be eligible for NRHP nomination, the BLM archaeologist will notify the Field Manager and the SHPO within 48 hours. The BLM and the SHPO will determine the effect of construction through discussion with the archaeologist and/or a site visit (as needed). The BLM archaeologist will ensure that the site is treated in accordance with a work plan agreed upon between the BLM, SHPO, the lead archaeological monitor, the EI, the construction supervisor, and the Proponent (as applicable given the circumstance). A goal of the work plan will be to allow construction to resume in the area in a capacity that will not further adversely affect the resource. This work plan will include detailed methods warranted to treat and further evaluate the discovery. Examples of such treatments include the installation of barricade fencing, additional salvage excavations and/or shovel tests, and/or prolonged avoidance for formal excavations.

After the BLM determines that the work plan has been successfully implemented in treating or minimizing further effects to NRHP-eligible discoveries, the BLM will notify the lead archaeological monitor that construction may resume in accordance with any necessary avoidance measures detailed in the work plan. The archaeologist will notify the EI and/or construction personnel (as appropriate) that the work may resume with any applicable stipulations. A brief summary of the discovery and work conducted will be provided in the weekly monitoring report that will be submitted to the EI, the BLM archaeologist(s), and the SHPO.

OPEN TRENCH DISCOVERIES

Both sides of the open pipeline trench will be visually inspected in an attempt to identify subsurface cultural material. Additionally, the exposed trench spoils will be inspected for cultural remains; however, the spoils will not be screened. This inspection will occur from the graded ground surface adjacent to the trench. Inspectors will not enter the trench or other excavated areas due to aforementioned safety concerns. The most likely OTI discoveries include subsurface

thermal features, although isolated artifacts, historic debris, and prehistoric house pits also may be encountered given the discoveries during previous adjacent pipeline construction. Much less likely are human and/or NAGPRA-related remains. The protocol for these types of discoveries is presented in the following section. All recordable cultural resources encountered during OTI will be reported on in the formal monitoring and OTI report.

Because the OTI discoveries are made after the construction equipment has left the area, these discoveries are typically not threatened by further construction-related disturbance. The main threat to these discoveries is wall collapse, particularly in areas of sandy, water-saturated, or otherwise unstable sediment. Pipe placement is also a time of possible trench slumps. Nevertheless, the notification protocol will be the same as described above. After the archaeologist determines the discovery is a recordable cultural site, basic information will be collected (e.g., geographic location, depth of natural ground surface to bladed surface, depth below bladed surface, depth and breadth of feature, feature contents, and photographs). Temporary datums (e.g., PVC pipe with a label) will be placed outside the edge of the ROW disturbance so that a straight line between datums bisects the center of the buried discovery. This will assist in conducting further work on the features and in the vicinity of the features, which could potentially occur immediately after discovery, as well as after the pipe has been installed and the ground surface has been reclaimed.

The on-call BLM archaeologist will be immediately notified after basic information has been collected on an OTI discovery. The BLM archaeologist will advise the OTI archaeologist regarding any further work necessary to determine NRHP eligibility. This is anticipated to typically entail subsurface shovel and/or auger testing in the vicinity of the discovery. The purpose of this testing is to evaluate the potential for associated subsurface cultural material, and the spatial extent of any cultural deposit, as these have a bearing on the ability of the site to contribute significant information. Deeply buried remains will be tested using telescoping augers and/or limited 1- by 1-meter test units to achieve the depths necessary to sample adjacent sediment. The results of this work will be immediately communicated to the on-call BLM archaeologist, who will either provide an NRHP assessment or make recommendations for additional work needed to make this assessment. For sites that are found by the BLM archaeologist to be eligible or likely to be eligible for NRHP nomination, the BLM archaeologist will notify the Field Manager and the SHPO within 48 hours.

Due to the nature of material exposed in the trench, barricade fencing or other avoidance measures typically is not needed, but may be placed as conditions warrant (e.g., very near surface features where additional surface disturbance may result in additional adverse effects). For NRHP-eligible resources, or resources likely to be eligible, any further actions needed prior to the installation and burial of the pipe will be detailed in a work plan that is agreed on by the BLM, SHPO, the lead archaeological monitor, the EI, the construction supervisor, and the Proponent (as applicable given the circumstance). After the BLM archaeologist has determined the work plan has been successfully implemented, the BLM will notify the lead archaeological monitor, who will relay this information to the EI and/or construction personnel (as appropriate).

Historic Trail Profiles

During OTI, the vicinity of historic trails will be inspected for evidence of buried trail profiles (e.g., ruts or swales). Any trail remnants visible in the trench walls will be photographed and the profile will be mapped and described. Other basic contextual information will be collected and the on-call BLM archaeologist will be immediately notified to provide guidance on any further work required.

DISCOVERY OF HUMAN OR NAGPRA-RELATED REMAINS

The procedural flowchart for known or suspected human and/or NAGPRA-related remains is outlined in Figure B.2. Construction will immediately cease within 300 feet of any known or suspected human remains or other NAGPRA-related items such as funerary objects, offerings, items of cultural patrimony, or sacred objects. Known or potential human or NAGPRA-related remains are not to be disturbed in any way upon discovery. If necessary, equipment may be shut down in place until it can be determined that removing it can be done without further disturbance. The remains are not to be moved or otherwise handled prior to the discovery being analyzed by the archaeological and/or tribal monitor. Barricades will be placed at least 50 feet from the discovery. The 300-foot buffer zone around the discovery will be promptly vacated by construction personnel, and vehicle traffic will be redirected outside of this buffer zone.

NOTIFICATION AND AUTHORIZATION PROCEDURES

All project personnel are authorized to stop work in the vicinity of suspected human and/or NAGPRA-related remains. For such discoveries made by non-archaeological/tribal Project personnel, the supervisor(s) will be immediately notified, who will then immediately notify the EI. The EI will immediately notify the lead archaeological monitor, who will immediately visit the discovery for further evaluation with the assistance of a tribal monitor. If the discovery is made by an archaeologist, the lead archaeological monitor will be notified, who will notify the EI.

The lead archaeological monitor and a tribal monitor will jointly investigate all potential human remains or NAGPRA-related items. A physical anthropologist may be consulted if necessary to determine if the remains are human. In the event that a discovery is determined not to be human and it is not on federal land, the lead archaeological monitor will notify the EI and the standard discovery plan will be followed (see Figure B.1). The same procedure will be followed for discoveries that do not include either human remains or NAGPRA-related items on federal land.

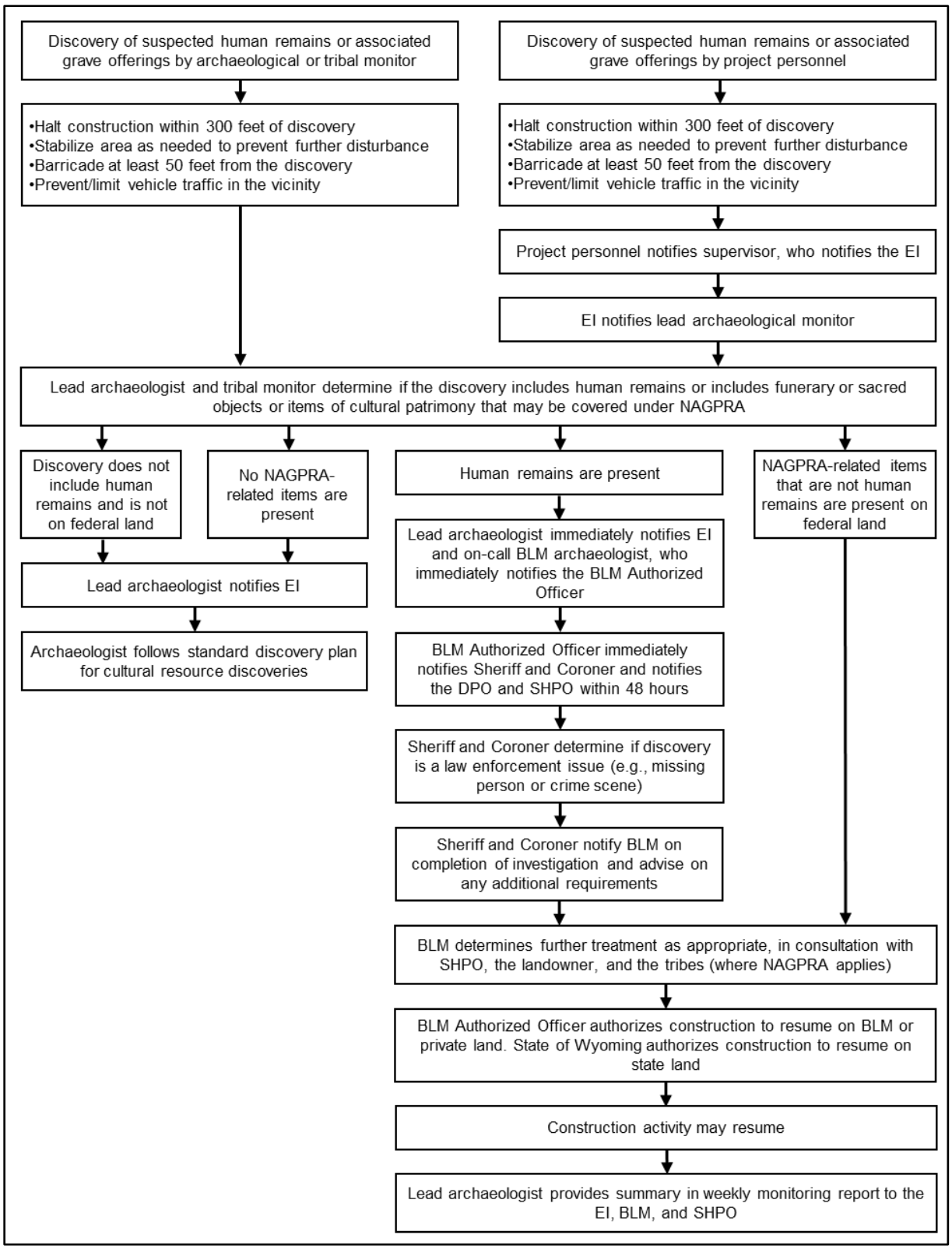


Figure B.2. Flowchart for discovery of known or suspected human remains or NAGPRA-related items.

In the event of the discovery of known or suspected human remains, the archaeologist may implement immediate measures to stabilize the area and protect the remains from exposure. For all known or suspected human remains as identified by the lead archaeological monitor the lead archaeological monitor will immediately notify the EI and the on-call BLM archaeologist, who will notify the BLM Authorized Officer immediately by phone with subsequent written notification. The Authorized Officer will notify the Sheriff and the Coroner immediately by phone. The BLM will notify the Deputy Preservation Officer (DPO) and SHPO within 48 hours. The Proponent also will be notified. The BLM archaeologist(s) may require the Proponent to provide 24-hour security to ensure the remains are properly protected.

The Sheriff and the Coroner will have the opportunity to conduct an investigation to determine if the discovery is a law enforcement issue as defined by Wyoming Statute § 7-4-104. The Sheriff and Coroner will notify the BLM when the investigation is complete and will advise the BLM of any additional requirements.

The BLM will then determine any further treatment necessary, in consultation with the SHPO, the landowner, and the tribes (where NAGPRA applies). When any further treatment is complete, the BLM Authorized Officer will authorize construction to resume on BLM or private land. The State of Wyoming authorizes construction to resume on state land. The lead archaeological monitor will provide a summary of all discoveries in a weekly monitoring report submitted to the EI, the BLM archaeologist(s), and the SHPO.

NON-NATIVE AMERICAN HUMAN REMAINS

Non-Native American human remains that are not Coroner cases will be afforded some allowance for formal excavation, and analysis/research under the direction of the BLM but in consultation with the SHPO and landowner. For example, controlled excavations may be appropriate to reveal whether the burial was intentional or accidental, and may provide information regarding associated clothing (e.g., leather, buckles, buttons, shoes, etc.) and other personal items. Measurements of the non-Native American human remains may reveal information regarding gender and stature, and a morphological analysis may reveal information regarding life history and cause of death.

NATIVE AMERICAN OR OTHER NAGPRA-RELATED REMAINS ON FEDERAL LAND

Upon completion of the law enforcement investigation (as applicable), the BLM will determine if the human remains are Native American, with the assistance of the Proponent's cultural resources contractor. In the event of the discovery of known or suspected Native American human remains (that do not constitute a law enforcement issue), funerary objects, sacred objects, and/or items of cultural patrimony on federal land, the Project personnel and BLM will meet the requirements of NAGPRA in accordance with 43 CFR § 10. The notification and authorization procedures described above are consistent with those required under 43 CFR § 10.4 (Inadvertent Discoveries). For NAGPRA-related discoveries such as funerary objects, sacred objects, and/or items of cultural patrimony that do not include human remains, the Sheriff and Coroner will not be notified. In addition to the above procedures, as soon as possible but no later than 3 days after

notification of discovery, the BLM will implement the following in accordance with 43 CFR § 10.4:

- certify the receipt of the notification;
- take steps to protect the discovery (as appropriate);
- provide a description of the remains and the nature of their discovery to Native American tribes likely to be affiliated with the remains;
- initiate consultation, provide information, request information, and prepare a written plan of action, following 42 CFR § 10.5(a) through (e); and
- ensure the treatment of all NAGPRA-related remains is conducted under 43 CFR § 10.6.

Construction may resume in the area no sooner than 30 days after certification by the BLM Authorized Officer of the receipt of written notification of the discovery. Construction may resume sooner than 30 days if a written, binding agreement is executed between the BLM and the affiliated Native American tribes (43 CFR § 10.4 [d][2]).

NATIVE AMERICAN REMAINS ON NON-FEDERAL LAND

Upon completion of the law enforcement investigation (as applicable), the BLM will determine if the human remains are Native American, with the assistance of the Proponent's cultural resources contractor. The discovery of known or suspected Native American human remains on state or private land will be handled in accordance with Wyoming Statute § 7-4. In addition to the procedures described in the Notification and Authorization Procedures section, the lead archaeological monitor will notify the Office of State Lands and Investments Director for any such discoveries on state land. If the remains are not a law enforcement issue, additional work on or around the discovery would be at the direction of the BLM archaeologist(s) in consultation with the SHPO, tribes, and the landowner. Such action may result in the excavation of the remains.

Within 48 hours of being notified of the discovery of Native American remains, the Proponent will advise the landowner of the discovery and inform the landowner that Native American tribe(s) may request to inspect the remains and offer recommendations regarding the further treatment and disposition of the remains.

REPORTING

During periods of active monitoring and OTI, the cultural resources contractor will be in real-time communication primarily with the lead EI and the on-call BLM archaeologist(s) regarding progress and discoveries. This information will be summarized by the lead archaeological monitor in weekly summary reports to the BLM archaeologist(s), SHPO, and lead EI. Weekly summary reports will include NRHP evaluations, a map with the locations of discoveries, and photographs as necessary to illustrate discoveries.

Following the conclusion of construction activities and associated monitoring and OTI for a construction season, the cultural resources contractor will provide a formal report detailing discoveries made during monitoring and OTI. This report will include an introduction that provides a background of Project location, culture history, and monitoring/OTI methods and

staff. The introduction will also include an overview of the approach to tribal monitoring and a summary of associated activities and schedules, and a list of tribes and tribal monitors involved. The report introduction will include a section that documents the cultural resources sensitivity training received by Project personnel that will contain a list of the personnel that received the training.

The body of the report will include narratives for every recordable discovery that describe the environmental setting, discovery contents, inventory results, photographs, maps, NRHP justifications, and evaluations of Project effect. Based on NRHP significance and additional information potential, the report will conclude with a ranking of historic properties according to their priority for post-construction mitigation, taking into consideration their potential to contribute additional information that would be significant to addressing data gaps in the understanding of particular time periods, site types, and/or geographies. This draft report will be submitted to the BLM for a 30-day review period. After BLM comments have been addressed and the revised report submitted to the BLM, the BLM will send the report to the THPOs and/or tribal representatives for a 30-day review period before it is finalized.

The draft report will be submitted to the BLM within 3 months following the end of a construction season. After any comments submitted by the THPOs and/or tribal representatives are addressed, the final report will be submitted to the BLM for subsequent SHPO concurrence within 6 months following the end of a construction season. If more time is needed for submitting the draft and final reports due to additional testing or excavation of discoveries, the cultural resources contractor will request an extension from the BLM.

APPENDIX C:
HISTORIC PROPERTIES TREATMENT PLANS (AS COMPLETED)

Appendix C – Supporting Mitigation Information

Appendix C1 – Mitigation

Appendix C1 – Mitigation

Table of Contents

THIS PAGE INTENTIONALLY LEFT BLANK

Table C1-1. Mitigation for Air Quality

Impact Indicator[1]	Initial Impacts (Agency Preferred Alternative)[2]	Strategy to Avoid, Minimize, and Rectify Impacts on the Resource			Residual Effects (Agency Preferred Alternative)[3]	Warrant Additional Mitigation?	Mitigation
		Avoidance[4]	Minimize[5]	Rectify/Restore[6]			Additional Mitigation
Air Quality (including Greenhouse Gas Emissions and Climate Change)							
▪ Cause or contribute to an exceedance of a national or state air quality standard for any criteria pollutant ▪ Substantially contribute to degradation of an important Air Quality Resource Value in surrounding Clean Air Act Class I or Sensitive Class II area ▪ Increase of chronic carcinogenic risk above a generally acceptable level	▪ The pipeline's physical and operational design would ensure that its only air pollutant emissions would consist of minor amounts of CO_2 escaping through valves and connections that cannot be welded. ▪ The pipeline would produce minor fugitive emissions during its operation and any leaks would be detected by the SCADA center. ▪ Air pollutant emission rates resulting from operating the Sweetening Plant and the pipeline would be small relative to typical emission rates from stationary industrial sources. ▪ Construction would generate fugitive dust emissions from earth-moving activities and wind erosion of disturbed areas. ▪ Most of the Proposed Action would be constructed in rural areas with little or no potential to affect local human populations. Pipeline construction activity would be dispersed over a 5-year period and over a geographical expanse of hundreds of miles. Instantaneous localized pollutant concentrations could be relatively high under some meteorological conditions but would not persist except during protracted temperature inversions that are not favored by the Project area topography. ▪ Indirect impacts from the Project would result from additional traffic related to increased employment in the area. Once the pipeline is operational, minimal maintenance would be expected; therefore, traffic-related impacts would be minimal. Consequently, additional traffic related to economic growth would be minimal and amount to only a small fraction of existing traffic levels in the Project area.	▪ None	▪ An existing Supervisory Control and Data Acquisition (SCADA) control center would be used to monitor and control the Project's operations, including a leak monitoring system. ▪ Sweetening Plant operations would be restricted by applicable air quality regulations and permit conditions designed to ensure that impacts on public health are within the bounds of acceptability as implied or defined within state and federal rules and statutes. ▪ Mobile source construction equipment would likely be subject to mobile source regulations that generally apply to the equipment manufacturers and not substantively to owner/operators. ▪ Design Feature 9 (Roads Reclamation) would be applied to roads that are no longer needed. Unneeded roads would be recontoured and revegetated. ▪ Design Feature 19 (Air Quality – Dust Control) would be applied to access roads or sections of the right-of-way as necessary. Mandatory speed limits (e.g., 35 miles per hour) would be implemented on vehicles using access roads or traveling the right-of-way. ▪ Design Feature 20 (Air and Vehicle Emissions) would be applied to ensure that construction equipment is maintained in good working condition and contains appropriate pollution-control devices to minimize gaseous emissions. ▪ Agency-Required Mitigation Measure 3 (Minimize or Avoid Disturbance to Sensitive Soils and Vegetation) would minimize ground disturbance and the potential for fugitive dust emissions.	▪ None	▪ Minimal localized and temporary effects • Implementation of design features for all construction and operation activities would further reduce impacts on air quality.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minimal, localized, and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-2. Mitigation for Cultural Resources

Impact Indicator[1]	Initial Impacts (Agency Preferred Alternative)[2]	Strategy to Avoid, Minimize, and Rectify Impacts on the Resource			Residual Effects (Agency Preferred Alternative)[3]	Warrant Additional Mitigation?	Mitigation
		Avoidance[4]	Minimize[5]	Rectify/Restore[6]			Additional Mitigation
Cultural Resources							
▪ Destruction or disturbance of intact surface or subsurface materials	▪ If not mitigated, direct and permanent ground disturbance of cultural resources resulting in damage to intact surface and subsurface cultural materials, such as artifacts and features, during construction of pipelines and associated facilities, staging stations, and access roads. ▪ If not mitigated, indirect long-term visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of National Register of Historic Places (NRHP) eligibility.	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to avoid adverse impacts on historic properties. ● In compliance with the requirements of Section 106 of the National Historic Preservation Act (NHPA), as detailed in the Programmatic Agreement for the Project, a Class III cultural resources inventory will be completed for the selected route, prior to construction. ● Micro-siting of the route will be conducted to avoid and minimize impacts on historic properties to the extent possible. ▪ Design Feature 16 (Cultural Resources). Site-specific measures will be developed in consultation with land-management agencies and the State Historic Preservation Officer (SHPO) and in accordance with the Programmatic Agreement to avoid or mitigate adverse impacts or provide for mitigation of historic properties, per mitigation measures required by the Programmatic Agreement. These could include Project modifications to avoid historic properties, monitoring during construction, and data recovery studies. ▪ Design Feature 17 (Cultural and Paleontological Resources). Regardless of jurisdiction, if an unexpected discovery is encountered during construction, work will be halted and the BLM authorized officer will be notified. Evaluation and appropriate mitigation measures will be developed.	▪ None	▪ None	▪ Direct impacts on historic properties would be effectively reduced and, in some instances, eliminated through Project design changes. ▪ If avoidance and minimization efforts do not completely resolve adverse effects, the BLM, in consultation with the Applicant, the SHPO, consulting parties, including the tribes, will ensure that an appropriate Historic Properties Treatment Plan (HPTP) is developed and implemented to mitigate Project-related effects on historic properties. ▪ All mitigation efforts would be in accordance with the Programmatic Agreement negotiated for this Project and would be documented in the HPTP (refer to Appendix B). Any adverse effects (direct or indirect) on historic properties under Section 106 of the NHPA would be mitigated as stipulated in the Programmatic Agreement. ▪ Specific mitigation measures on locations and resources of Native American concern would be developed by the BLM in consultation with the appropriate tribe and would be implemented to mitigate any identified adverse effects. These may include Project modifications to avoid, minimize, and mitigate any identified adverse effects.	▪ No. Any adverse effects (direct or indirect) on historic properties under Section 106 of the NHPA would be mitigated as stipulated in the Programmatic Agreement.	▪ Not applicable
▪ Impacts on visual, atmospheric, and auditory intrusions that could compromise aspects of site integrity, such as setting, feeling, and association, which are components of NRHP eligibility	▪ Direct and indirect permanent disturbances of cultural resources due to changes in public accessibility (e.g., unauthorized use of access roads)	▪ None.	▪ Agency-Required Mitigation Measure 9 (Minimize New or Improved Accessibility) would be implemented to limit access to areas and prevent potential vandalism.	▪ Agency-Required Mitigation Measure 8 (Interim and Intense Reclamation) would be applied to rectify the effects of construction and reduce and eliminate the effects over time.	▪ No unacceptable impacts would occur.	▪ No. No unacceptable impacts would occur.	▪ Not applicable

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-3. Mitigation for Fish and Aquatics							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
Special-Status Fish Species							
▪ Water quality or thermal-related mortality ▪ Population decline or changes, and loss of genetic integrity as a result of individual mortality	▪ Crosses Beaver Creek and Spring Creek, which support a core conservation population of Colorado River cutthroat trout ▪ Located within watersheds regulated for downstream depletions to the Colorado River and Platte River to protect federally listed fish species and critical habitat ▪ Crosses the Big Sandy River occupied by BLM-sensitive flannelmouth sucker and bluehead sucker	▪ The Applicant proposes to horizontally directionally drill under Spring Creek, the Green River, Big Sandy River and Sweetwater River to avoid impacts on riparian and fish habitat. ▪ Design Feature 29 (Waters – Waterbodies and Wetlands) would be applied where waters of the U.S., including wetlands, would need to be avoided to the maximum extent practicable. Where these features cannot be completely avoided, impacts would be minimized through design modification, as necessary. Facilities (e.g., flowlines and staging areas) would be sited to avoid and/or minimize impacts; however, where impacts are anticipated, measures would be employed to minimize impacts (e.g., use of culverts to maintain downstream flow/drainage). This design feature would be applied to avoid water courses and wetlands and minimize and/or reduce potential for impacts on riparian areas and water courses by siting project facilities outside of these areas.	▪ Design Feature 26 (Waste Management, Wastewater) would be applied to any wastewater generated in association with temporary, portable sanitary facilities. ▪ Design Feature 27 (Water – Stormwater Pollution Prevention Plan) would be applied prior to commencement of construction to ensure that proper sediment and erosion control and reporting procedures are followed. ▪ Design Feature 28 (Water – Road Drainage) would be applied to avoid or minimize damage to water-delivery infrastructure and/or interference with delivery of water. ▪ Design Feature 30 (Water – Waterbodies and Wetlands [construction]) would be applied to any construction that occurs in or adjacent to wetlands and streams and would use Applicant-committed BMPs listed to protect surface water quality and to minimize impacts on those resources. ▪ Additionally, any crossing or construction activities adjacent to these streams would be conducted according to Applicant-committed BMPs, which are described in greater detail in the Plan of Development (POD), Appendix G. The exact types of crossings employed at specific waterbodies are not available for this analysis but will be detailed in the POD developed for Project construction, which would be subject to agency review and approval prior to any construction activities.	▪ None	▪ Few to no residual impacts • Temporary decreases in water quality during Project construction	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minimal, localized, and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
Special-Status Fish Species – Aquatic Conservation Areas							
▪ Permanent and temporary habitat loss ▪ Effects on habitat use through behavioral modifications resulting in habitat use displacement, including disruption of reproduction, foraging, and predation ▪ Disruption to fish and aquatic organism passage and migration ▪ Habitat fragmentation	▪ Special-Status Fish Species • Crosses Beaver Creek and Spring Creek, which support a core conservation population of Colorado River cutthroat trout • Located within watersheds regulated for downstream depletions to the Colorado River and Platte River to protect federally listed fish species and critical habitat	▪ The Applicant proposes to use horizontal directional drilling under Spring Creek, the Green River, the Big Sandy River, and the Sweetwater River to avoid impacts on riparian and fish habitat. ▪ Design Feature 29 (Waters – Waterbodies and Wetlands) would be applied where waters of the U.S., including wetlands, would need to be avoided to the	▪ Design Feature 30 (Water – Waterbodies and Wetlands [construction]) would be applied to any construction that occurs in or adjacent to wetlands and streams and would use Applicant-committed BMPs listed to protect surface water quality and to minimize impacts on those resources. ▪ Additionally, any crossing or construction activities adjacent to	▪ None	▪ Few to no residual impacts due to the use of HDD • Temporary loss or use of habitat during Project construction	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minimal, localized, and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this	▪ Not applicable

Table C1-3. Mitigation for Fish and Aquatics							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
	• Crosses the Big Sandy River occupied by BLM-sensitive flannelmouth sucker and bluehead sucker ▪ Aquatic Conservation Areas • Crosses the Green River-Birch Creek and Green River-Beaver Creek Wyoming Game and Fish Department (WGFD), both aquatic conservation areas • Crosses Trail Ridge – Upper Beaver Watershed, an aquatic crucial priority area • Crosses the Upper Big Sandy River, an aquatic conservation area and WGFD aquatic crucial priority area • Crosses the Little Sandy Creek, an aquatic conservation area	maximum extent practicable. Where these features cannot be completely avoided, impacts would be minimized through design modification, as necessary. Facilities (e.g., flowlines and staging areas) would be sited to avoid and/or minimize impacts; however, where impacts are anticipated, measures would be employed to minimize impacts (e.g., use of culverts to maintain downstream flow/drainage). This design feature would be applied to avoid water courses and wetlands and minimize and/or reduce the potential for impacts on riparian areas and water courses by siting Project facilities outside of these areas.	these streams would be conducted according to Applicant-committed BMPs, which are described in greater detail in the POD, Appendix G. The exact types of crossings employed at specific waterbodies are not available for this analysis but will be detailed in the POD developed for Project construction, which would be subject to agency review and approval prior to any construction activities.			resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	
Wyoming Game and Fish Crucial Streams, Blue and Red Ribbon Trout Streams							
▪ Permanent and temporary habitat loss ▪ Disruption to fish and aquatic organism passage and migration ▪ Habitat fragmentation	▪ Crosses the Green River, a crucial stream and a red ribbon trout stream ▪ Crosses the Trail Ridge – Upper Beaver Watershed, an aquatic crucial priority area ▪ Crosses the Big Sandy River, a crucial stream ▪ Crosses the Upper Big Sandy River, a WGFD aquatic crucial priority area	▪ Agency-Required Mitigation Measure 1 (sensitive resource avoidance) would be applied to avoid mortality, in-stream habitat loss, disruption of spawning or passage, or water quality impacts. Crucial streams and red and blue ribbon trout streams would be subject to HDD to avoid moderate and high impacts.	▪ Agency-Required Mitigation Measure 7 (seasonal restrictions) would be applied when seasonal restrictions on construction activities are needed to avoid temporally sensitive periods, including spawning.	▪ None	▪ Few to no residual effects due to use of HDD • Potential for frac-outs (release of drilling fluids) exists during HDD operations, but impacts would be minimized by requiring biological monitoring and following response protocols	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minimal and localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
Wyoming Game and Fish Crucial Streams, Blue and Red Ribbon Trout Stream – Aquatic Conservation Area							
▪ Introduction of invasive and noxious aquatic species	▪ Special-Status Fish Species • Crosses Beaver Creek and Spring Creek, which support a core conservation population of Colorado River cutthroat trout • Located within watersheds regulated for downstream depletions to the Colorado River and Platte River to protect federally listed fish species and critical habitat • Crossed the Big Sandy River occupied by BLM-sensitive flannelmouth sucker and bluehead sucker ▪ Wyoming Game and Fish Crucial Streams, Blue and Red Ribbon Trout Streams • Crosses the Green River, a crucial stream and a red ribbon trout stream	▪ None	▪ Design Feature 31 (Water – Control of Aquatic Invasive Species) would be applied to avoid, reduce, and/or minimize the potential for the spread of AIS.	▪ None	▪ Few to no residual impacts • Minor increases in invasive and noxious aquatic species could occur; any effects would be minimal and localized.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minimal and localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

Table C1-3. Mitigation for Fish and Aquatics							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
	• Crosses Trail Ridge – Upper Beaver Watershed, an aquatic crucial priority area • Crosses the Big Sandy River, a crucial stream • Crosses the Upper Big Sandy River, a WGFD aquatic crucial priority area ▪ Aquatic Conservation Areas • Crosses the Green River-Birch Creek and Green River-Beaver Creek WGFD, both aquatic conservation areas • Crosses Trail Ridge – Upper Beaver Watershed, an aquatic crucial priority area • Crosses the Upper Big Sandy River, an aquatic conservation area and WGFD aquatic crucial priority area • Crosses the Little Sandy Creek, an aquatic conservation area						

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-4. Mitigation for Geology and Topography							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
Geology and Topography (Geologic Hazards)							
▪ Increased potential for geological hazards (i.e., earthquakes and landslides) from the Project	▪ Not anticipated to affect faults or cause earthquakes; only a small number of faults are crossed by the Project and they are all classified as Class B and are most likely post-Quaternary in age ▪ Potential contribution to the destabilization of slopes in steep areas or in areas of previous landslides	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance). The pipeline alignment would be adjusted to avoid areas prone to geological hazards to the extent possible. • May include preparation of seismic report to identify the presence or absence of faults	▪ Agency-Required Mitigation Measure 2 (Minimize Construction on Greater Slopes). Minimizing construction on steep slopes decreases the potential for erosion and water runoff, thereby minimizing contribution of the Project to landslides. ▪ Design Feature of the Proposed Action for Environmental Protection 21 (Mitigation Measure Development) would be applied to establish mitigation measures, as needed, based on the mutual agreement of Denbury and the Bureau of Land Management (BLM), to address changing conditions or requirements within the Project area throughout the operational phase. ▪ The Project may potentially include special designs to prevent future slumping.	▪ None	▪ No effects are anticipated. The implementation of Project design features for environmental protection and agency-required mitigation measures would reduce the potential of the Project to contribute to the incidence of geological hazards.	▪ No. No residual effects are anticipated.	▪ Not applicable

Table C1-4. Mitigation for Geology and Topography							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
Mineral Resources							
▪ Potential effects on oil and gas production and mining operations	▪ Crosses 162.3 miles of existing leases, 4.7 miles of producing oil and gas or geothermal wells, and 73.8 miles of potential mineral resources	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance). The pipeline alignment would be adjusted to avoid oil and gas development and other mineral operations to the extent possible.	▪ None	▪ None	▪ Moderate impacts on 162.3 miles of existing leases from loss of a mineral resource caused by construction activities or limitation of development and extraction of mineral resources from the presence of permanent facilities could occur; however, the BLM expects that the Applicant would resolve any conflicts regarding mineral ownership and access along the selected route, including any compensation for economic impacts on leaseholders or landowners. Also, it is the responsibility of the right-of-way grantee to conduct proper due diligence to ensure that legally valid mining claims are respected and agreements are made with claim owners. In general, the BLM expects that the likelihood and potential for such conflict are low and the effect small. ▪ The Project will be used for enhanced oil recovery (EOR) at Bell Creek Field. ▪ Also, the Project will be oversized in construction to permit additional CO_2 transport when additional sources are found. The transport of CO_2 could be beneficial to future EOR projects.	▪ No. The Applicant would resolve any conflicts regarding mineral ownership and access along the selected route, including any compensation for economic impacts on leaseholders or landowners. ▪ The nature and extent of residual effects identified through the NEPA process indicate that effects would be minimal and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-5. Mitigation for Lands and Realty							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
Lands and Realty							
▪ Physical or direct, long-term conflicts with existing land uses	▪ Crosses 136.1 miles of existing land uses, including existing oil and gas pipelines and wells, a compressor pump station, and existing transmission lines	▪ Design Feature 22 (Lands and Realty) would be applied to avoid impacts on existing utility infrastructure and to protect and preserve existing survey monuments and markers during the construction and operational phases of the Project. ▪ Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied where the Project could directly affect existing land uses.	▪ Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied where the Project could directly affect existing land uses specifically in areas where soils and vegetation are particularly sensitive to disturbance or where existing roads/two-tracks to be used for construction and maintenance would not be widened or otherwise upgraded to the extent practicable. ▪ Mitigation Measure 5 (Overland Access) would be applied where the Project could directly affect existing land uses. This measure would be applied during the construction phase.	▪ None	▪ 4.3 miles of moderate impacts on existing land use are anticipated where the permanent infrastructure will conflict with developed land uses, including existing oil and gas pipelines and wells, a compressor pump station, and existing transmission lines. Predicted effects include temporary and permanent disturbance to the land type, interference with existing utility infrastructure, and interference or potential conflict with future land use projects. ▪ The BLM expects that the Applicant would resolve any conflicts regarding conflict with developed land uses and access along the selected route, including any compensation for economic impacts on leaseholders or landowners.	▪ The Applicant would resolve any conflicts with developed land uses and access along the selected route, including any compensation for economic impacts on leaseholders or landowners. ▪ The nature and extent of residual effects identified through the NEPA process indicate that effects would be minimal and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
▪ Physical or direct, long-term conflicts with authorized projects and future land use	▪ Crosses 175.8 miles of authorized projects ▪ Crosses 7.9 miles of future projects identified in LR2000 ▪ Crosses 58.6 miles of future land use actions	▪ Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied where the Project could directly affect authorized or future land uses.	▪ Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied where the Project could directly affect authorized or future land uses, specifically in areas where soils and vegetation are particularly sensitive to disturbance or where existing roads/two-tracks to be used for construction and maintenance would not be widened or otherwise upgraded to the extent practicable. ▪ Mitigation Measure 9 (Minimize New or Improved Accessibility) would be applied where the Project could directly affect authorized or pending road rights-of-way.	▪ None	▪ Few to no residual effects on authorized projects and future land uses are anticipated. • Major conflicts are avoided. The BLM expects that the Applicant would resolve any conflicts regarding conflict authorized projects and future land use along the selected route, including any compensation for economic impacts on leaseholders or landowners.	▪ Major conflicts are avoided. The Applicant would resolve any conflicts authorized projects and future land uses along the selected route, including any compensation for economic impacts. ▪ The nature and extent of residual effects identified through the NEPA process indicate that effects would be minimal and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-6. Mitigation for Livestock Grazing							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
Livestock Grazing							
▪ Displacement or disturbance from lambing and calving areas; increased mortality of livestock	▪ Crosses 237 miles of grazing allotments	▪ Design Feature 2 (Wildlife and Livestock – Disturbance and Harassment). All Applicant personnel would be instructed to avoid harassment and disturbance of wildlife and livestock, especially during reproductive seasons. ▪ Design Feature 7 (Roads – General Use). Traffic would be restricted to roads developed for the Project, which would decrease livestock mortality.	▪ Temporary fencing may be used to secure hazardous areas during construction. ▪ Where necessary, cattle guards would be installed along new access roads to prevent cattle from wandering from their respective pastures. ▪ Prior to construction, the Applicant would coordinate with livestock grazing permittees to discuss preferences for timing of construction. ▪ Design Feature 3 (Wildlife and Livestock – Vehicle Collisions) would limit speeds of Project-related vehicles to 35 miles per hour to ensure safe and efficient traffic flow and to reduce collisions with livestock. ▪ Design Feature 33 (Reclamation Public Access). Limiting public access during construction and reclamation would minimize disturbance to grazing allotments.	▪ Design Feature 13 (Vegetation Noxious Weeds). Noxious weed surveys would be conducted prior to construction so that preventive management measures could be applied as warranted pursuant to the Project's Noxious Weed Management Plan, which would prevent transport of weed species during construction and reduce the spread of weeds in livestock foraging areas. • Design Feature 14 (Vegetation General Maintenance). Once reclamation is complete, weed surveys would be conducted on a regular basis. Access roads would be monitored for noxious weeds and treated as outlined in the Noxious Weed Management Plan. ▪ Agency-Required Mitigation Measure 8 (Interim and Intense Reclamation). Interim reclamation could be required where establishment of seedlings has been shown or is expected to be difficult (e.g., soil types prone to wind erosion and vegetation communities prone to noxious weeds or disturbance), which would rectify the effects over time and promote reclamation success (e.g., forage vegetation).	▪ Few to no residual effects • Minor, localized, and temporary displacement or disturbance of livestock • Increased mortality of livestock is not anticipated.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minimal, localized, and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
▪ Reduction in forage availability in grazing allotments; temporary alteration of grazing patterns and locations; spread of noxious and invasive weeds, lowering forage quality	▪ Crosses 237 miles of grazing allotments	▪ Design Feature 29 (Waters-Waterbodies and Wetlands). Wetlands and riparian areas would be avoided or effects would be minimized through design modification, which would avoid or minimize impacts on riparian areas (including water sources used by livestock operations). ▪ Design Feature 30 (Waters-Waterbodies and Wetlands Construction). Any construction in or adjacent to wetlands and streams (including water sources used by livestock operations) would use Applicant-committed BMPs to avoid or minimize impacts on water quality. ▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would require design modification at riparian areas, which could minimize impacts on water	▪ Design Feature 10 (Soils-Erosion Control). Permanent erosion-control devices would minimize the potential for additional erosion and the introduction of noxious weeds and increase reclamation success (e.g., forage vegetation). ▪ Agency-Required Mitigation Measure 6 (Minimize Tree Clearing) in riparian vegetation communities would minimize impacts on riparian areas used as water sources for livestock.	▪ Supplemental water sources will be provided for livestock in the event that Project activities restrict access to existing water sources. ▪ Design Feature 9 (Roads Reclamation) would result in the closing, recontouring, and reclamation of roads that are no longer needed, which would rectify forage vegetation. ▪ Design Feature 11 (Soils-Topsoil Handling). Stockpiling native topsoil would reduce or eliminate effects on forage vegetation over time.	▪ Few to no residual effects • Temporary reduction of forage availability in grazing allotments, temporary alteration of grazing patterns and locations, and temporary reduction in forage species used for livestock grazing • Some increased potential for spread of noxious and invasive weeds from construction and maintenance activities	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minimal, localized, and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

Table C1-6. Mitigation for Livestock Grazing							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
		sources used by livestock operations. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would limit ground disturbance within 500 feet of streams, wetlands, and riparian areas, which would avoid impacts on water sources used by livestock operations.					
▪ Interference with access to grazing allotments; economic impact on grazing permittees	▪ Crosses 237 miles of grazing allotments	▪ None	▪ Design Feature 8 (Roads Maintenance) would provide safe road conditions for construction and maintenance personnel, as well as grazing permittees.	▪ The Applicant would compensate operators for livestock injured as a result of the Project.	▪ No residual effects are anticipated. • Access to grazing allotment will be maintained. • Any loss of livestock will be compensated.	▪ Not applicable	▪ Not applicable

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-7. Mitigation for National Historic Trails							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
National Trail Management and Components							
▪ Substantially interfere with or be incompatible with the nature and purpose of a National Scenic Trail (NST) or a National Historic Trail (NHT); adversely modify the NST's or NHT's resources, qualities, values, associated settings, or primary use or uses	▪ Oregon NHT/Mormon Pioneer NHT/Pony Express NHT • High initial impacts = 10.7 miles • Moderate initial impacts = 6.4 miles • Crosses the South Pass High Potential Route Segment and Auto Tour Route in areas with limited cultural modifications; this segment is identified in the National Park Service Trail Management Plan. Crosses two contributing segments (48SW827 and 48SW827_444). • Two additional contributing segments are located in proximity to the Agency Preferred Alternative (i.e., 2.9 miles southwest and 1.5 miles northeast). • The Project would introduce geometric forms and linear elements not commonly found in the area. The area being crossed is mostly intact with very few modifications. ▪ California NHT • High initial impacts = 6.4 miles	▪ Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied where the Project could directly affect scenic values. This mitigation measure would be applied to avoid placement of above-ground facilities in visually sensitive areas and micro-siting of the alignment to reduce visual contrast introduced by the Project. • Application of this measure would include boring under NHT segments for a minimum or 0.25 mile on either side of the NHT and avoiding the siting of construction access routes over contributing trail segments, in order to ensure that the Project would be consistent with the Bureau of Land Management (BLM) Rock Springs Resource Management Plan. ▪ Agency-Required Mitigation Measure 5 (Overland Access)	▪ Agency-Required Mitigation Measure 2 (Minimize Construction on Greater Slopes) would be applied in areas where the construction of access roads would require switchbacks and additional areas to be graded. The mitigation measure would reduce contrast created by new access roads through the reduction of earthwork in sloped areas where grading could expose underlying soils, which would increase color, form, and texture contrast. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied where existing access would potentially need to be widened or upgraded for construction and maintenance. It would reduce visual contrast, particularly modifications to the existing landscape's line and color elements, by reducing the widening and additional clearing of adjacent vegetation for access, as well as minimizing the area of	▪ Agency-Required Mitigation Measure 4 (Blend Road Cuts and Grading) would be applied where grading in steep rocky areas creates strong visual contrast in the landscape. Blending and/or coloring areas of cut and fill would reduce contrast between the exposed ground and the surrounding environment. ▪ Agency-Required Mitigation Measure 8 (Interim or Intense Reclamation) would be applied where the Project would generate long-term visual contrast through the removal of slow-to-regenerate vegetation communities and where this contrast would be inconsistent with the nature and purpose of an NST or NHT, or both. Through the application of more intensive reclamation techniques, the visual contrast introduced by the Project would be diminished and would begin to blend with the existing landscape's form, line, color, and texture.	▪ Considering application of these mitigation measures, the Project would still modify the experience along the affected NHTs, but the NHT's nature and purpose would not be substantially compromised. • Any adverse effects (direct or indirect) to National Historic Trails under Section 106 of the NHPA would be mitigated as stipulated in the Programmatic Agreement. ▪ These modifications to the NHT experience would occur initially until intense reclamation efforts successfully blend the Project's geometrically cleared right-of-way with the existing landscape outside of the area where the Project was bored under the NHT. ▪ Oregon NHT • No high residual impacts would occur • 10.9 miles of moderate residual impacts and 9.8 miles of low residual impacts are anticipated ▪ Mormon Pioneer NHT • No high residual impacts would occur • 10.9 miles of moderate residual impacts and 9.3 miles of low residual impacts are anticipated ▪ Pony Express NHT	▪ No. All mitigation efforts would be in accordance with the Programmatic Agreement negotiated for this Project and would be documented in the HPTP (refer to Appendix B). Any adverse effects (direct or indirect) to National Historic Trails under Section 106 of the NHPA would be mitigated as stipulated in the Programmatic Agreement. ▪ If avoidance, minimization, and reclamation measures do not completely resolve adverse effects, the BLM, in consultation with the Applicant, the SHPO, consulting parties, including the tribes, will ensure that an appropriate HPTP is developed and implemented to mitigate Project-related effects on historic properties.	▪ Not applicable

Table C1-7. Mitigation for National Historic Trails

Impact Indicator[1]	Initial Impacts (Agency Preferred Alternative)[2]	Strategy to Avoid, Minimize, and Rectify Impacts on the Resource			Residual Effects (Agency Preferred Alternative)[3]	Warrant Additional Mitigation?	Mitigation
		Avoidance[4]	Minimize[5]	Rectify/Restore[6]			Additional Mitigation
	• Moderate initial impacts = 12.8 miles • Located approximately 1.5 miles from the North Piney Creek to Smith's Fork High Potential Route Segment (also known as the Lander Cutoff of the California NHT). • Due to the high level of visual screening afforded by Riley Ridge and the level of existing cultural modification adjacent to the Project, there would be minimal effects on the trail's nature and purpose. ▪ Continental Divide National Scenic Trail (CDNST) • High initial impacts = 0.0 mile • Moderate initial impacts = 3.3 miles • The addition of the Project in proximity to the CDNST would marginally influence this national scenic trail's nature and purpose. This is due to the presence of existing pipelines, a 230kV transmission line, and mining operations, which have altered the natural setting in the CDNST's viewshed.	would be applied where the Project would generate additional long-term visual contrast through the removal of slow-to-regenerate vegetation communities as part of the construction of access roads. The construction contractor would use overland access, such as drive-and-crush, driving over vegetation where the vehicles would access the site, rather than blading and grading, thus modifying the landscape less significantly.	disturbance in characteristic vegetation communities. ▪ Agency-Required Mitigation Measure 6 (Minimize Tree Clearing) would be applied where the Project crosses overstory vegetation (e.g., pinyon-juniper or riparian corridors). It would reduce impacts by decreasing visual contrast created by the removal of overstory vegetation (trees) and the hard visual line created by the cleared right-of-way/forest interface. In addition to reducing visual contrast, this agency-required mitigation measure would minimize disturbance in characteristic vegetation communities. ▪ Agency-Required Mitigation Measure 9 (Minimize New or Improved Accessibility) would be applied where access roads that are needed for construction, but not for maintenance, would be rehabilitated. It would reduce the modification of the line and color elements of visual contrast, in particular, where road construction would occur in slow-to-regenerate vegetation communities.		• No high residual impacts would occur • 10.9 miles of moderate residual impacts and 9.8 miles of low residual impacts are anticipated ▪ California NHT • No high residual impacts would occur • 10.9 miles of moderate residual impacts and 17.5 miles of low residual impacts are anticipated ▪ CDNST • No high residual impacts would occur • 2 miles of moderate residual impacts and 7.3 miles of low residual impacts are anticipated		
Scenic Resources							
▪ Contrast produced by the Project would demand attention and would dominate views from the National Trail centerline where form, line, color, and texture of Project components would be incongruent with existing landscape or historic features.	▪ Oregon NHT/Mormon Pioneer NHT/Pony Express NHT • Introduced geometric forms into Class B and C landscapes (refer to Section 3.2.19.3.1 for a description of Class A, B, and C landscapes) through rural scenery with stippled mounds of sagebrush and black sagebrush with limited existing cultural modifications. ▪ Mormon Pioneer NHT • The Project would introduce geometric forms into Class B and C landscapes (refer to Section 3.2.19.3.1 for a description of Class A, B, and C landscapes) through rural scenery with stippled mounds of sagebrush and black sagebrush with limited existing cultural modifications. ▪ California NHT • The Project would introduce additional geometric forms into Class A and Class C landscapes similar to other cultural modifications in the area. Due to the screening of views and lack	▪ Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied where the Project could directly affect scenic values. This mitigation measure would be applied to avoid placement of above-ground facilities in visually sensitive areas and micro-siting of the alignment to reduce visual contrast introduced by the Project. • Application of this measure would include boring under NHT segments for a minimum or 0.25 mile on either side of the NHT and avoiding the siting of construction access routes over contributing trail segments, in order to ensure that the Project would be consistent with the Bureau of Land Management (BLM) Rock Springs Resource Management Plan. ▪ Agency-Required Mitigation Measure 5 (Overland Access)	▪ Agency-Required Mitigation Measure 2 (Minimize Construction on Greater Slopes) would be applied in areas where the construction of access roads would require switchbacks and additional areas to be graded. The mitigation measure would reduce contrast created by new access roads through the reduction of earthwork in sloped areas where grading could expose underlying soils, which would increase color, form, and texture contrast. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied where existing access would potentially need to be widened or upgraded for construction and maintenance. It would reduce visual contrast, particularly modifications to the existing landscape's line and color elements, by reducing the widening and additional clearing of adjacent vegetation for access, as well as minimizing the area of	▪ Agency-Required Mitigation Measure 4 (Blend Road Cuts and Grading) would be applied where grading in steep rocky areas creates strong visual contrast in the landscape. Blending and/or coloring areas of cut and fill would reduce contrast between the exposed ground and the surrounding environment. ▪ Agency-Required Mitigation Measure 8 (Interim or Intense Reclamation) would be applied where the Project would generate long-term visual contrast through the removal of slow-to-regenerate vegetation communities and where this contrast would be inconsistent with the nature and purpose of an NST or NHT, or both. Through the application of more intensive reclamation techniques, the visual contrast introduced by the Project would be diminished and would begin to blend with the existing landscape's form, line, color, and texture.	▪ In Segment 1, the Agency Preferred Alternative is the longest route; however, it would introduce the least amount of moderate residual impacts, as it crosses through landscapes that are less sensitive with more cultural modifications (through Segment 1). ▪ In Segment 2, the Agency Preferred Alternative would have moderate residual impacts due to crossing a larger amount of visually sensitive landscapes, such as Jack Morrow Hills and The Pinnacles Scenic Quality Rating Units. No high residual effects are anticipated. ▪ In Segment 3, the Agency Preferred Alternative crosses through a highly modified landscape and the route does not cross any high sensitivity landscapes. No high residual impacts are anticipated.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be moderate but most residual effects would be reduced over time. Long-term residual effects associated with the presence of Project facilities would be localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

Table C1-7. Mitigation for National Historic Trails

Impact Indicator[1]	Initial Impacts (Agency Preferred Alternative)[2]	Strategy to Avoid, Minimize, and Rectify Impacts on the Resource			Residual Effects (Agency Preferred Alternative)[3]	Warrant Additional Mitigation?	Mitigation
		Avoidance[4]	Minimize[5]	Rectify/Restore[6]			Additional Mitigation
	of historic trail-association recreation resources in the area, the effect of these modifications on the historic trail's setting and characteristics would be minimal. ▪ CDNST ● The Project would introduce geometric forms into Class B and C landscapes with existing linear utility development. Due to the extent of existing cultural modifications, the Project would introduce elements similar to the existing pipelines traversing these landscapes.	would be applied where the Project would generate additional long-term visual contrast through the removal of slow-to-regenerate vegetation communities as part of the construction of access roads. The construction contractor would use overland access, such as drive-and-crush, driving over vegetation where the vehicles would access the site, rather than blading and grading, thus modifying the landscape less significantly.	disturbance in characteristic vegetation communities. ▪ Agency-Required Mitigation Measure 6 (Minimize Tree Clearing) would be applied where the Project crosses overstory vegetation (e.g., pinyon-juniper or riparian corridors). It would reduce impacts by decreasing visual contrast created by the removal of overstory vegetation (trees) and the hard visual line created by the cleared right-of-way/forest interface. In addition to reducing visual contrast, this agency-required mitigation measure would minimize disturbance in characteristic vegetation communities. ▪ Agency-Required Mitigation Measure 9 (Minimize New or Improved Accessibility) would be applied where access roads that are needed for construction, but not for maintenance, would be rehabilitated. It would reduce the modification of the line and color elements of visual contrast, in particular, where road construction would occur in slow-to-regenerate vegetation communities.			
▪ High quality, diverse, and rare or unique scenery (Class A or B [BLM Manual H-8410-1]) would be modified where the setting is a defining factor for the high potential route segments or as seen from historic properties and/or interpretive areas or NST centerlines.	▪ Oregon NHT ● Crosses 7.8 miles of Class B Landscape with high sensitivity ● 0.0–0.5 mile crossed = 4.6 miles ● 0.5–1.0 mile crossed = 5.5 miles ● 1.0 mile–2.0 miles crossed = 6.4 miles ● 2.0–3.0 miles crossed = 3.9 miles ● 3.0 or more miles crossed = 0.3 mile ▪ Mormon Pioneer NHT ● Crosses 7.3 miles of Class B Landscape with high sensitivity ● 0.0–0.5 mile crossed = 4.6 miles ● 0.5–1.0 mile crossed = 5.5 miles ● 1.0 mile–2.0 miles crossed = 6.4 miles ● 2.0–3.0 miles crossed = 3.9 miles ● 3.0 or more miles crossed = 0.3 mile ▪ Pony Express NHT ● Crosses 7.8 miles of Class B Landscape with high sensitivity ● 0.0–0.5 mile crossed = 4.6 miles ● 0.5–1.0 mile crossed = 5.5 miles ● 1.0 mile–2.0 miles crossed = 6.4 miles ● 2.0–3.0 miles crossed = 3.7 miles ● 3.0 or more miles crossed = 0.0 mile	▪ Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied where the Project could directly affect scenic values. This mitigation measure would be applied to avoid placement of above-ground facilities in visually sensitive areas and micro-siting of the alignment to reduce visual contrast introduced by the Project. ● Application of this measure would include boring under NHT segments for a minimum or 0.25 mile on either side of the NHT and avoiding the siting of construction access routes over contributing trail segments, in order to ensure that the Project would be consistent with the Bureau of Land Management (BLM) Rock Springs Resource Management Plan. ▪ Agency-Required Mitigation Measure 5 (Overland Access) would be applied where the Project would generate	▪ Agency-Required Mitigation Measure 2 (Minimize Construction on Greater Slopes) would be applied in areas where the construction of access roads would require switchbacks and additional areas to be graded. The mitigation measure would reduce contrast created by new access roads through the reduction of earthwork in sloped areas where grading could expose underlying soils, which would increase color, form, and texture contrast. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied where existing access would potentially need to be widened or upgraded for construction and maintenance. It would reduce visual contrast, particularly modifications to the existing landscape's line and color elements, by reducing the widening and additional clearing of adjacent vegetation for access, as well as minimizing the area of disturbance in characteristic vegetation communities.	▪ Agency-Required Mitigation Measure 4 (Blend Road Cuts and Grading) would be applied where grading in steep rocky areas creates strong visual contrast in the landscape. Blending and/or coloring areas of cut and fill would reduce contrast between the exposed ground and the surrounding environment. ▪ Agency-Required Mitigation Measure 8 (Interim or Intense Reclamation) would be applied where the Project would generate long-term visual contrast through the removal of slow-to-regenerate vegetation communities and where this contrast would be inconsistent with the nature and purpose of an NST or NHT, or both. Through the application of more intensive reclamation techniques, the visual contrast introduced by the Project would be diminished and would begin to blend with the existing landscape's form, line, color, and texture. ▪ Any unavoidable effects would be mitigated to an acceptable level per the Programmatic Agreement.	▪ From Key Observation Point (KOP) P-2 Green River in Segment 1, the Project would present users with a linear clearing of vegetation, which is typical of pipeline construction, maintenance, and operation, through the riparian corridor adjacent to the Green River. The Agency Preferred Alternative would cross the Green River in an agricultural area on the east side of the river. Due to the vegetation type in the area, this clearing would revegetate much sooner than the northern crossing where natural vegetation is found. Through application of agency-required mitigation measures, including boring under the river and riparian vegetation, the effects on views would be minimized to the extent practicable. ▪ From KOP RS-1 Red Desert Backcountry Byway, the Applicant's Proposed Action would introduce a wide geometric band that would parallel a large portion of the Red Desert Backcountry Byway. ▪ From KOP RS-2 U.S. Highway 191, the APA would introduce a type of geometric band that is similar to the landscape associated with the APA, but the band would be partially screened due to the topography.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor to moderate but most residual effects would be reduced over time. Long-term residual effects associated with the presence of Project facilities would be localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

Table C1-7. Mitigation for National Historic Trails

Impact Indicator[1]	Initial Impacts (Agency Preferred Alternative)[2]	Strategy to Avoid, Minimize, and Rectify Impacts on the Resource			Residual Effects (Agency Preferred Alternative)[3]	Warrant Additional Mitigation?	Mitigation
		Avoidance[4]	Minimize[5]	Rectify/Restore[6]			Additional Mitigation
	▪ California NHT and Sublette Cutoff ● Crosses 2.5 miles of Class A Landscape with high sensitivity ● Crosses 7.8 miles of Class B Landscape with high sensitivity ● 0.0–0.5 mile crossed = 4.6 miles ● 0.5–1.0 mile crossed = 5.5 miles ● 1.0 mile–2.0 miles crossed = 6.4 miles ● 2.0–3.0 miles crossed = 3.9 miles ● 3.0 or more miles crossed = 8.0 miles ▪ CDNST ● Crosses 1.3 miles of Class B Landscape with high sensitivity ● 0.0–0.5 mile crossed = 1.2 miles ● 0.5–1.0 mile crossed = 1.1 miles ● 1.0 mile–2.0 miles crossed = 4.5 miles ● 2.0–3.0 miles crossed = 2.4 miles ● 3.0 or more miles crossed = 0.1 mile	additional long-term visual contrast through the removal of slow-to-regenerate vegetation communities as part of the construction of access roads. The construction contractor would use overland access, such as drive-and-crush, driving over vegetation where the vehicles would access the site, rather than blading and grading, thus modifying the landscape less significantly. ▪ Any unavoidable effects would be mitigated to an acceptable level per the Programmatic Agreement.	▪ Agency-Required Mitigation Measure 6 (Minimize Tree Clearing) would be applied where the Project crosses overstory vegetation (e.g., pinyon-juniper or riparian corridors). It would reduce impacts by decreasing visual contrast created by the removal of overstory vegetation (trees) and the hard visual line created by the cleared right-of-way/forest interface. In addition to reducing visual contrast, this agency-required mitigation measure would minimize disturbance in characteristic vegetation communities. ▪ Agency-Required Mitigation Measure 9 (Minimize New or Improved Accessibility) would be applied where access roads that are needed for construction, but not for maintenance, would be rehabilitated. It would reduce the modification of the line and color elements of visual contrast, in particular, where road construction would occur in slow-to-regenerate vegetation communities. ▪ Any unavoidable effects would be mitigated to an acceptable level per the Programmatic Agreement.		▪ From KOP L-1 U.S. Highway 287, in a highly modified landscape, the Project would be in the view for a short duration. ▪ From KOP C-1 U.S. Highway 20, the Project would affect the views for a short duration due to the perpendicular crossing of the highway in a highly modified landscape.		
Recreation (including Travel Management)							
▪ Intact resource values, including recreation and National Trail-related travel management opportunities and values, would be substantially compromised by the Project.	▪ Oregon NHT/Mormon Pioneer NHT/Pony Express NHT ● Impacts on trail viewers (e.g., viewers using the auto tour route, historic trail segments, and adjacent recreation areas) resulting from Alternative 3B: Lost Creek to Lost Cabin would be most intense within 0.5 mile of the Project, where additional geometric forms are introduced into the viewshed, similar to existing line utility development. These trail viewers would view approximately 5.9 miles of the 10.0 miles of the Project within the trail study corridor with views of the remaining portion of the Project screened by topography. Additionally, of the 6.7 miles of the auto tour route located in the trail study corridor, 3.5 miles would have potential views of the Project with the remaining portion screened by topography. These effects would occur within the NHTs Destination Special Recreation Management Area	▪ Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied where the Project could directly affect scenic values. This mitigation measure would be applied to avoid placement of above-ground facilities in visually sensitive areas and micro-siting of the alignment to reduce visual contrast introduced by the Project. ● Application of this measure would include boring under NHT segments for a minimum or 0.25 mile on either side of the NHT and avoiding the siting of construction access routes over contributing trail segments, in order to ensure that the Project would be consistent with the Bureau of Land Management (BLM) Rock Springs Resource Management Plan.	▪ Agency-Required Mitigation Measure 2 (Minimize Construction on Greater Slopes) would be applied in areas where the construction of access roads would require switchbacks and additional areas to be graded. The mitigation measure would reduce contrast created by new access roads through the reduction of earthwork in sloped areas where grading could expose underlying soils, which would increase color, form, and texture contrast. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied where existing access would potentially need to be widened or upgraded for construction and maintenance. It would reduce visual contrast, particularly modifications to the existing landscape's line and color elements, by reducing the widening and additional clearing of adjacent vegetation for access, as well as minimizing the area of	▪ Agency-Required Mitigation Measure 4 (Blend Road Cuts and Grading) would be applied where grading in steep rocky areas creates strong visual contrast in the landscape. Blending and/or coloring areas of cut and fill would reduce contrast between the exposed ground and the surrounding environment. ▪ Agency-Required Mitigation Measure 8 (Interim or Intense Reclamation) would be applied where the Project would generate long-term visual contrast through the removal of slow-to-regenerate vegetation communities and where this contrast would be inconsistent with the nature and purpose of an NST or NHT, or both. Through the application of more intensive reclamation techniques, the visual contrast introduced by the Project would be diminished and would begin to blend with the existing landscape's form, line, color, and texture.	▪ With the implementation of agency-required mitigation measures to mitigate Project effects on scenery and views, recreation values would not be substantially compromised.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects on recreation values would be minor and most residual effects would be reduced over time. Long-term residual effects associated with the presence of Project facilities would be localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

Table C1-7. Mitigation for National Historic Trails							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
	and Extensive Recreation Management Area. ▪ California NHT ● Same as Oregon NHT ▪ CDNST ● Same as Oregon NHT	▪ Agency-Required Mitigation Measure 5 (Overland Access) would be applied where the Project would generate additional long-term visual contrast through the removal of slow-to-regenerate vegetation communities as part of the construction of access roads. The construction contractor would use overland access, such as drive-and-crush, driving over vegetation where the vehicles would access the site, rather than blading and grading, thus modifying the landscape less significantly.	disturbance in characteristic vegetation communities. ▪ Agency-Required Mitigation Measure 6 (Minimize Tree Clearing) would be applied where the Project crosses overstory vegetation (e.g., pinyon-juniper or riparian corridors). It would reduce impacts by decreasing visual contrast created by the removal of overstory vegetation (trees) and the hard visual line created by the cleared right-of-way/forest interface. In addition to reducing visual contrast, this agency-required mitigation measure would minimize disturbance in characteristic vegetation communities. ▪ Agency-Required Mitigation Measure 9 (Minimize New or Improved Accessibility) would be applied where access roads that are needed for construction, but not for maintenance, would be rehabilitated. It would reduce the modification of the line and color elements of visual contrast, in particular, where road construction would occur in slow-to-regenerate vegetation communities.				
Biological and Natural Resources							
▪ Natural values, including any key contributing values and characteristics, would be substantially compromised by the Project (e.g., a riparian area adjacent to a route segment follows what would be cleared for access roads).	▪ Oregon NHT/Mormon Pioneer NHT/Pony Express NHT ● Modified characteristic landscapes associated with the Oregon NHT, including sagebrush and desert scrub landscapes, as well as riparian corridors, Including the crossing of the Sweetwater River and the sagebrush plains located among the peaks of the Granite Mountains. These modifications would be similar to those associated with existing linear utility development in the area. ▪ California NHT ● Introduced additional geometric forms into landscapes adjacent to the historic trail corridor, which would be mostly screened from view. ▪ CDNST ● Modified landscapes adjacent to the CDNST, including sagebrush and desert scrub landscapes, as well as riparian corridors (e.g., Crooks Creek). These modifications would be similar to those associated with existing	▪ Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied where the Project could directly affect scenic values. This mitigation measure would be applied to avoid placement of above-ground facilities in visually sensitive areas and micro-siting of the alignment to reduce visual contrast introduced by the Project. ● Application of this measure would include boring under NHT segments for a minimum or 0.25 mile on either side of the NHT and avoiding the siting of construction access routes over contributing trail segments, in order to ensure that the Project would be consistent with the Bureau of Land Management (BLM) Rock Springs Resource Management Plan. ▪ Agency-Required Mitigation Measure 5 (Overland Access)	▪ Agency-Required Mitigation Measure 2 (Minimize Construction on Greater Slopes) would be applied in areas where the construction of access roads would require switchbacks and additional areas to be graded. The mitigation measure would reduce contrast created by new access roads through the reduction of earthwork in sloped areas where grading could expose underlying soils, which would increase color, form, and texture contrast. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied where existing access would potentially need to be widened or upgraded for construction and maintenance. It would reduce visual contrast, particularly modifications to the existing landscape's line and color elements, by reducing the widening and additional clearing of adjacent vegetation for access, as well as minimizing the area of	▪ Agency-Required Mitigation Measure 4 (Blend Road Cuts and Grading) would be applied where grading in steep rocky areas creates strong visual contrast in the landscape. Blending and/or coloring areas of cut and fill would reduce contrast between the exposed ground and the surrounding environment. ▪ Agency-Required Mitigation Measure 8 (Interim or Intense Reclamation) would be applied where the Project would generate long-term visual contrast through the removal of slow-to-regenerate vegetation communities and where this contrast would be inconsistent with the nature and purpose of an NST or NHT, or both. Through the application of more intensive reclamation techniques, the visual contrast introduced by the Project would be diminished and would begin to blend with the existing landscape's form, line, color, and texture.	▪ With the implementation of agency-required mitigation measures to mitigate Project effects on scenery and views, natural values would not be substantially compromised.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects on natural values would be minor and most residual effects would be reduced over time. Long-term residual effects associated with the presence of Project facilities would be localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

Table C1-7. Mitigation for National Historic Trails

Impact Indicator[1]	Initial Impacts (Agency Preferred Alternative)[2]	Strategy to Avoid, Minimize, and Rectify Impacts on the Resource			Residual Effects (Agency Preferred Alternative)[3]	Warrant Additional Mitigation?	Mitigation
		Avoidance[4]	Minimize[5]	Rectify/Restore[6]			Additional Mitigation
	linear utility development in the area.	would be applied where the Project would generate additional long-term visual contrast through the removal of slow-to-regenerate vegetation communities as part of the construction of access roads. The construction contractor would use overland access, such as drive-and-crush, driving over vegetation where the vehicles would access the site, rather than blading and grading, thus modifying the landscape less significantly.	disturbance in characteristic vegetation communities. ▪ Agency-Required Mitigation Measure 6 (Minimize Tree Clearing) would be applied where the Project crosses overstory vegetation (e.g., pinyon-juniper or riparian corridors). It would reduce impacts by decreasing visual contrast created by the removal of overstory vegetation (trees) and the hard visual line created by the cleared right-of-way/forest interface. In addition to reducing visual contrast, this agency-required mitigation measure would minimize disturbance in characteristic vegetation communities. ▪ Agency-Required Mitigation Measure 9 (Minimize New or Improved Accessibility) would be applied where access roads that are needed for construction, but not for maintenance, would be rehabilitated. It would reduce the modification of the line and color elements of visual contrast, in particular, where road construction would occur in slow-to-regenerate vegetation communities.				
Historic and Cultural Resources							
▪ There would be an adverse effect on historic and cultural resources associated with the National Trail. Characteristics of historic properties located in the National Trail corridor or seen from the National Trail centerline would be modified to the extent that they would no longer contribute to the NRHP eligibility of the National Trail. Impacts could include direct impacts on historic properties or visual impacts on the settings of historic properties.	▪ Oregon NHT/Mormon Pioneer NHT/Pony Express NHT ● The Project would cross one NHT Class II trail segment, and the Project would be visible from 3.5 miles of the 6.8 miles of NHT Class I and II segments in the historic trail study corridor with views from the remaining segments screened by topography. ▪ California NHT ● Alternative 1 C: Figure Four would not cross trail-related sites and segments. ● Alternative 2A: Proposed Action would cross an NHT Class I trail segment and would be visible from 6.7 miles of the 9.3 miles of NHT Class I and II segments in the trail study corridor. Two contributing segments of the Sublette Cutoff of the California NHT are noted along this alternative route. This alternative route would cross one trail segment, while the other would be 1.5 miles to the west-southwest. During the NHT	▪ Any unavoidable adverse effects would be mitigated to an acceptable level per the Programmatic Agreement.	▪ Any unavoidable adverse effects would be mitigated to an acceptable level per the Programmatic Agreement.	▪ Any unavoidable adverse effects would be mitigated to an acceptable level per the Programmatic Agreement.	▪ Any adverse effects (direct or indirect) to National Historic Trails under Section 106 of the NHPA would be mitigated as stipulated in the Programmatic Agreement.	▪ No. All mitigation efforts would be in accordance with the Programmatic Agreement negotiated for this Project and would be documented in the HPTP (refer to Appendix B). Any adverse effects (direct or indirect) to National Historic Trails under Section 106 of the NHPA would be mitigated as stipulated in the Programmatic Agreement. ● If avoidance, minimization, and reclamation measures do not completely resolve adverse effects, the BLM, in consultation with the Applicant, the SHPO, consulting parties, including the tribes, will ensure that an appropriate HPTP is developed and implemented to mitigate Project-related effects on historic properties.	▪ Not applicable

Table C1-7. Mitigation for National Historic Trails							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
	inventory (Rockwell et al. 2012), an additional contributing segment of the Sublette Cutoff of the California NHT was documented (48SW1841_80) and it would be crossed by the alternative route. Segments also recorded during this inventory include a series of trail segments extending northeast and east several hundred feet from Alternative 2A: Proposed Action. Additional contributing segments of the trail were documented by the Wyoming Recreation Commission in the Wyoming Cultural Records Office data, but these recommendations have not been reviewed by the BLM or the state historic preservation officer. Alternative 2A: Proposed Action would cross the Sublette Cutoff of the California NHT in an area that contributes to the NRHP eligibility of the trails. • A variant of the Sublette Cutoff, known as the North Sublette Meadow Springs variant, would also be within 3 miles of this alternative route at NHT crossings. Historically, this variant (48SU7344) led to North Sublette Meadow Spring and then back to the Sublette Cutoff. One contributing segment of this trail would be 1,600 feet south of Alternative 2A: Proposed Action. ▪ CDNST • No historic trail-related cultural or historic resources are located in the Project's study area associated with the CDNST.						

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-8. Mitigation for Lands with Wilderness Characteristics

Impact Indicator[1]	Initial Impacts (Agency Preferred Alternative)[2]	Strategy to Avoid, Minimize, and Rectify Impacts on the Resource			Residual Effects (Agency Preferred Alternative)[3]	Warrant Additional Mitigation?	Mitigation
		Avoidance[4]	Minimize[5]	Rectify/Restore[6]			Additional Mitigation
North Pacific Creek (Unit WY040-2011-059)							
▪ Effects on wilderness characteristics: • Sufficient size—8,014 acres • Naturalness—the unit is remote and undeveloped • Solitude—there are ample opportunities for solitude • Primitive and unconfined recreation—heritage tourism, hunting, hiking, photography, and wildlife viewing • Supplemental values	▪ Crosses the unit for approximately 0.9 mile near the southern boundary of the unit along U.S. Highway 28.	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) was applied to the extent possible during alternative route development. Also, placement of aboveground facilities (such as mainline valves and associated distribution lines) would reduce visual contrast introduced by the Project.	▪ None. Design features and agency-required mitigation measures would be applied as appropriate to address resources for which the area is managed.	▪ None. Design features and agency-required mitigation measures would be applied as appropriate to address resources for which the area is managed.	▪ Would remove 131.7 acres from the contiguous unit. The remaining size of the unit would be reduced to 7,882.7 acres, which would be above the 5,000-acre size requirement. • Short-term effects on the naturalness, solitude, and unconfined and primitive recreation of the area would be related to visual resources and noise, dust, and vehicle emissions from construction activities and equipment. Access to the remaining portion of the North Pacific Creek unit would not be affected. • Over the long term, the Project would include influencing the area's wilderness characteristics along the southern edge of the unit. • Whether to manage the unit to protect wilderness characteristics has not been considered through a public planning process; thus, potential impacts on the unit include potential limitation on future management options.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would not reduce the unit to below the 5,000-acre size requirement. Most effects on wilderness characteristics would be short-term, although some long-term effects would be minor and localized to the southern edge of the unit. Therefore, the residual effects do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
Mowing Machine Draw (Unit WY040-2011-069)							
▪ Effects on wilderness characteristics: • Sufficient size—8,115 acres • Naturalness—southern portion of this unit is considered to be relatively pristine • Solitude • Primitive and unconfined recreation—outstanding opportunities • Supplemental values	▪ None. The Project would be located at the southern boundary of the unit along County Road 21 (Bar X Road); the unit would not be crossed by the Project.	▪ None	▪ None	▪ None	▪ Only short-term, minor residual effects are anticipated. • Short-term effects on the naturalness, solitude, and unconfined and primitive recreation of the area would be related to visual resources; noise, dust, and vehicle emissions from construction activities and equipment; and potential restrictions on access to the inventoried area during construction. • Long-term impacts from location of the Project along the existing county road would not affect the size, naturalness, or solitude of the area or change permanent access to unconfined recreation.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would not reduce the unit to below the 5,000-acre size requirement. Most effects on wilderness characteristics would be short-term, although some long-term effects would be minor and localized to the area along an existing county road. Therefore, the residual effects do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
Bush Creek (Unit WY040-2011-074)							
▪ Effects on wilderness characteristics: • Sufficient size—8,236 acres • Naturalness—extremely remote • Solitude—sufficient topography to shield users from other users • Primitive and unconfined recreation—hunting, hiking,	▪ None. The Project would be located at the southern boundary of the unit along County Road 21 (Bar X Road); the unit would not be crossed by the Project.	▪ None	▪ None	▪ None	▪ Only short-term, minor residual effects are anticipated. • Short-term effects on the naturalness, solitude, and unconfined and primitive recreation of the area would be related to visual resources; noise, dust, and vehicle emissions from construction activities and equipment; and potential restrictions on access to	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would not reduce the unit to below the 5,000-acre size requirement. Most effects on wilderness characteristics would be short-term, although some long-term effects would be minor and localized to the area along an	▪ Not applicable

Table C1-8. Mitigation for Lands with Wilderness Characteristics

Impact Indicator[1]	Initial Impacts (Agency Preferred Alternative)[2]	Strategy to Avoid, Minimize, and Rectify Impacts on the Resource			Residual Effects (Agency Preferred Alternative)[3]	Warrant Additional Mitigation?	Mitigation
		Avoidance[4]	Minimize[5]	Rectify/Restore[6]			Additional Mitigation
photography, and wildlife viewing • Supplemental values					the inventoried area during construction. ▪ Long-term impacts from location of the Project along the existing county road would not affect the size, naturalness, or solitude of the area or change permanent access to unconfined recreation.	existing county road. Therefore, the residual effects do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-9. Mitigation for Paleontological Resources

Impact Indicator[1]	Initial Impacts (Agency Preferred Alternative)[2]	Strategy to Avoid, Minimize, and Rectify Impacts on the Resource			Residual Effects (Agency Preferred Alternative)[3]	Warrant Additional Mitigation?	Mitigation
		Avoidance[4]	Minimize[5]	Rectify/Restore[6]			Additional Mitigation
Paleontological Resources							
▪ Destruction or disturbance of paleontological resources	▪ Crosses 147.5 miles of areas with Potential Fossil Yield Classification (PFYC) 5 ▪ Crosses 4.7 miles of areas with PFYC 4 ▪ Direct and permanent ground disturbance resulting in damage to paleontological resources during construction of pipelines and associated facilities, staging stations, and access roads	▪ Design Feature 15 (Paleontological Resources). Site-specific measures will be developed in consultation with land-management agencies to avoid or mitigate adverse impacts. These could include preparation of a Paleontological Resource Treatment Plan, survey of the selected route prior to construction, monitoring during ground-disturbing at predetermined site, deposition in a paleontological repository, and curation. ▪ Design Feature 17 (Cultural and Paleontological Resources). Regardless of jurisdiction, if an unexpected discovery is encountered during construction, work will be halted and the Bureau of Land Management (BLM) authorized officer will be notified. Evaluation and appropriate mitigation measures will be developed. ▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied where the Project would cross previously identified paleontological resources. On a case-by-case basis, the BLM may choose to cross and mitigate a paleontological resource rather than move the pipeline alignment.	▪ None	▪ None	▪ Few to no effects on paleontological resources are anticipated. • Any potential adverse residual effects would be mitigated per stipulations outlined in the Paleontological Resource Treatment Plan.	▪ No. Any potential adverse residual effects would be mitigated per stipulations outlined in the Paleontological Resource Treatment Plan.	▪ Not applicable

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-10. Mitigation for Recreation							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
Recreation Management Areas							
▪ Conflict with any applicable adopted management prescription or goal of the affected land management agency	▪ Crosses the Lander Field Office extensive recreation management area (ERMA), which is managed to provide extensive and unstructured recreation ▪ Crosses the Green Mountain ERMA, which is managed to maintain recreation sites, national and regional trails, local system trails, trailheads, and interpretive sites ▪ Crosses the Continental Divide National Scenic Trail (CDNST) ERMA, which is managed to limit recreation-use impacts, ensure visitor safety, reduce recreation conflicts, and support the nature and purpose of the CDNST ▪ Crosses the Western ERMA, which is managed to provide health and safety of visitors, prevent or mitigate resource damage, and minimize conflicts and adverse impacts on recreation opportunities ▪ Crosses the Oregon Mormon Pioneer California special recreation management area (SRMA), which is managed to protect the quality of cultural, natural, and historic values, as well as protect certain trail corridors in their natural condition for outdoor recreation and public use ▪ Crosses the CDNST SRMA, which is managed for long-term protection of recreation outcomes and settings, including cultural site visitation, photography, horseback riding, hiking, hunting, and mountain biking	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) was applied to the extent possible during alternative route development. ▪ Only below-ground facilities are permitted in the Western ERMA and Lander Field Office Frontier Right-of-Way corridor (used to cross the Lander Field Office ERMA, the Green Mountain ERMA, the CDNST ERMA, the Western ERMA, and the CDNST SRMA); no overhead facilities would be placed in these management areas or this corridor; rather, solar-powered mainline valves would be required instead of distribution lines, or the lines would be buried, thereby reducing above-ground facilities. ▪ Right-of-way crossings are allowed in the Oregon Mormon Pioneer California SRMA with stipulations governing exact crossing and restoration procedures.	▪ None	▪ None	▪ Few to no residual effects would occur. • No direct effects on the Lander Field Office ERMA • No effects on the Green Mountain ERMA, since no known recreation sites, national and regional trails, local system trails, trailheads, or interpretive sites would be affected by the Project in the Green Mountain ERMA. • Effects on the CDNST ERMA would be temporary and localized during construction and reclamation and would include short-term conflicts with recreation opportunities and the nature and purpose of the CDNST. • Effects on the Western ERMA would be temporary and localized during construction and reclamation and would include disturbance and reduced access to recreation opportunities. • Effects on the Oregon Mormon Pioneer California SRMA would be temporary and localized during construction and reclamation and would include short-term impacts on the quality of cultural, natural, and historic values. • Effects on the Oregon Mormon Pioneer California SRMA would be temporary and localized and would include short-term impacts on scenery, trails, and dispersed recreation.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be temporary and localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
Recreation Sites and Trails							
▪ Physical conflict with existing recreation resources or uses	▪ Skirts South Long Island Green River walk-in fishing site ▪ Crosses the CDNST	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) was applied to the extent possible during alternative route development.	▪ Agency-Required Mitigation Measure 6 (Minimizing Tree Clearing) would be implemented at recreation sites and trails to reduce impacts on recreation experiences. ▪ Design Features 24 and 25 would be implemented at recreation sites to reduce construction and traffic noise from Project construction.	▪ Agency-Required Mitigation Measure 8 (Interim and Intense Reclamation) would be applied to promote re-establishment of vegetation communities, returning the area to the pre-construction condition in order to reduce visual impacts on recreation experiences. ▪ Design Feature 9 (Roads Reclamation) would require reclaiming all roads no longer needed, returning access to recreation resources to preconstruction levels.	▪ Improved long-term access to recreation resources ▪ Otherwise, few to no residual effects would occur. • Effects on the South Long Island Green River walk-in fishing site would be temporary and localized and would include short-term reduced access during construction and reclamation and diminished recreation experiences through removal of vegetation and construction noise. • Potential direct effects on the CDNST include temporary effects on recreation experience and scenic qualities from placement of permanent above-ground facilities near recreation sites.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be temporary and localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

Table C1-10. Mitigation for Recreation

Impact Indicator[1]	Initial Impacts (Agency Preferred Alternative)[2]	Strategy to Avoid, Minimize, and Rectify Impacts on the Resource			Residual Effects (Agency Preferred Alternative)[3]	Warrant Additional Mitigation?	Mitigation
		Avoidance[4]	Minimize[5]	Rectify/Restore[6]			Additional Mitigation
Off-Highway Vehicles							
▪ Conflict with any applicable adopted management prescription or goal of the affected land management agency (direct and indirect effects)	▪ Crosses off-highway vehicle areas designated as "Limited to Existing Roads," "Designated," and "Limited" with seasonal designations.	▪ None	▪ None	• None	▪ Little to no residual effects would occur. • Short-term, indirect impacts on recreation would occur due to a potential change in access to parking for these areas.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be temporary and localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
Recreation Opportunity Spectrum							
▪ Conflict with any applicable adopted management prescription or goal of the affected land management agency (direct and indirect effects)	▪ Crosses recreation opportunity spectrum categories roaded natural for 0.5 mile and rural for 7.2 miles. Rural is managed for the setting and experience of a substantially modified natural environment with the prevalence of other individuals and groups. Roaded natural is managed for the setting and experience of predominantly natural-appearing environment with low to moderate user interaction and resource modification evident	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) was applied to the extent possible during alternative route development.	▪ Design Features 24 and 25 would be implemented at recreation sites to reduce construction and traffic noise from Project construction.	▪ Agency-Required Mitigation Measure 8 (Interim and Intense Reclamation) would be applied to promote re-establishment of vegetation communities, returning the area to the pre-construction condition in order to reduce visual impacts on recreation experiences. ▪ Design Feature 9 (Roads Reclamation) would require reclaiming all roads no longer needed, returning access to recreation resources to preconstruction levels.	▪ Few to no residual effects would occur. • Effects on rural and roaded natural areas would be temporary and localized and would include temporary effects on recreation experience associated with construction and reclamation activities. • Effects on roaded natural areas include increased interaction with other users and diminished opportunity to interact with the natural environment where permanent facilities are located.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be temporary and localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
Scenic Byways and Backways							
▪ Physical conflict with existing recreation resources or uses (direct and indirect effects)	▪ Crosses or parallels 39.7 miles of scenic byways or backways	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) was applied to the extent possible during alternative route development	▪ None	▪ Agency-Required Mitigation Measure 8 (Interim and Intense Reclamation) would be applied to promote re-establishment of vegetation communities, returning the area to the pre-construction condition in order to reduce visual impacts. ▪ Design Feature 9 (Roads Reclamation) would require reclaiming all roads no longer needed, returning access to recreation resources to preconstruction levels.	▪ Few to no residual effects would occur. • Effects on scenic byways or backways would be temporary and localized and would include temporary closure of the roads and increased traffic from construction vehicles. • Permanent facilities and the introduction of noxious weeds and invasive species during construction could degrade scenic qualities of the backways and byways; however, with implementation of agency-required mitigation measures and design features for environmental protection, effects would be expected to be minimal.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor, temporary, and localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-11. Mitigation for Soils and Reclamation							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
Soil Resources							
▪ Loss of soil due to accelerated erosion	▪ Clearing would remove protective vegetation cover and would expose soils to the effects of wind, sun, and precipitation, which could potentially increase soil erosion and the transport of sediment to sensitive areas, such as wetlands or waterbodies.	▪ Design Feature 5 (Roads – General Design) would be applied to avoid excessive grades on roads, road embankments, ditches, and drainages when possible, especially in areas with erodible soils. ▪ Design Feature 12 (Soils – Wet Soils during Construction) would be applied to construction activities when soils are wet. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied to areas where soils are sensitive to water and wind erosion or are susceptible to compaction. ▪ Agency-Required Mitigation Measure 5 (Overland Access) would be applied to limit construction access to overland drive-and-crush (i.e., vegetation is crushed, but not cropped; soil is compacted, but no surface soil is removed). This mitigation measure may include access to work areas, spur roads, and wetland areas requiring crane mats for access.	▪ Design Feature 6 (Access Roads – General Design) would be applied to ensure that access roads follow natural contours where possible and minimize side hill cuts. ▪ Design Feature 10 (Soils – Erosion Control) would be applied to areas where permanent erosion-control devices would be installed during Project construction. ▪ Design Feature 11 (Soils – Topsoil Handling) would be applied to ensure that topsoil material suitable for site reclamation would be removed in conjunction with clearing and grading and would be reserved in stockpiles.	▪ Design Feature 9 (Roads Reclamation) would be applied to ensure that abandoned and unused roads would be contoured and revegetated. ▪ Design Feature 32 (Reclamation Roadways) would be applied to ensure that access roads would be regraded, topsoil would be replaced, and all disturbed areas would be revegetated.	▪ The Project would result in approximately 3,451 acres of temporary disturbance and 199 acres or permanent disturbance (i.e. where permanent Project facilities are placed. ▪ The Project would cross soils with moderate to high susceptibility to water erosion (42 and 5.9 miles, respectively) and moderate to high susceptibility to wind erosion (122.3 and 22.4 miles, respectively) where interim or intense reclamation would be required; however, with implementation of agency-required mitigation, few to no residual impacts related to soil loss due to accelerated erosion would occur.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minimal and localized, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
▪ Substantively compromise reclamation potential (i.e., soils with low or moderate reclamation potential)	▪ Pipeline construction activities, such as clearing, grading, trench excavation, backfilling, heavy equipment traffic, and restoration, could result in adverse impacts on soil resources along the construction right-of-way, in temporary work areas, and on new and improved access roads.	▪ Design Feature 5 (Roads – General Design) would be applied to avoid excessive grades on roads, road embankments, ditches, and drainages when possible, especially in areas with erodible soils. ▪ Design Feature 12 (Soils – Wet Soils during Construction) would be applied to construction activities when soils are wet. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied to areas where soils are sensitive to water and wind erosion or are susceptible to compaction. ▪ Agency-Required Mitigation Measure 5 (Overland Access) would be applied to limit construction access to overland drive-and-crush (i.e., vegetation is crushed, but not	▪ Design Feature 6 (Access Roads – General Design) would be applied to ensure that access roads follow natural contours where possible and minimize side hill cuts. ▪ Design Feature 10 (Soils – Erosion Control) would be applied to areas where permanent erosion-control devices would be installed during Project construction. ▪ Design Feature 11 (Soils – Topsoil Handling) would be applied to ensure that topsoil material suitable for site reclamation would be removed in conjunction with clearing and grading and would be reserved in stockpiles.	▪ Agency-Required Mitigation Measure 8 (Interim or Intense Reclamation) would be applied in those areas where disturbance of soils has decreased reclamation potential or where higher impacts on soils have been identified. This mitigation measure would include: • Stabilization and/or irrigation of specific areas where establishment of seedlings have been shown or are expected to be difficult • Intense reclamation (beyond reseeding), typically for locations where higher impacts on soil resources have been identified. This could include changing seed mixes, planting shrub/perennials, completing color treatments of exposed soil/rock, and adding amendments to soil.	▪ The Project would result in approximately 3,451 acres of temporary disturbance and 199 acres or permanent disturbance (i.e. where permanent Project facilities are placed. ▪ The Project would cross soils with low or moderate reclamation potential (63 and 34.4 miles, respectively) where interim or intense reclamation would be required; however, with implementation of agency-required mitigation, few to no residual impacts related to compromising reclamation potential.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minimal and localized, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation strategy as warranting additional appropriate mitigation.	▪ Not applicable

Table C1-11. Mitigation for Soils and Reclamation							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
		cropped; soil is compacted, but no surface soil is removed). This mitigation measure may include access to work areas, spur roads, and wetland areas requiring crane mats for access.					

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-12. Mitigation for Special Designations							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
Areas of Critical Environmental Concern							
▪ Impacts on relevant and important values and management of Areas of Critical Environmental Concern (ACECs)	▪ No ACECs would be crossed by the Project. ▪ The Project would be located near the Greater Sand Dunes ACEC, managed to protect geology features, prehistoric and historic values of national significance, and recreation values of regional and national importance.	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource avoidance) was applied to the extent possible during alternative route development.	▪ None	▪ None	▪ Few to no residual effects • No direct effects on the Greater Sand Dunes ACEC are anticipated. • Potential indirect effects on the Greater Sand Dunes ACEC include improved access to the ACEC, increased spread of noxious weeds and invasive species, and degradation of the scenic qualities of the ACEC.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
▪ Conflict with ability of the area to be managed as prescribed	▪ No ACECs would be crossed by the Project. ▪ No impacts on management of ACECs would be anticipated.	—	—	—	—	—	—
Wilderness Study Areas							
▪ Potential impacts on the wilderness attributes	▪ No wilderness study area (WSAs) would be crossed by the Project. ▪ The Project would be located near the Alkali Draw WSA. The relevant and important values of the Alkali Draw WSA include recreation, scenery, ecology, geology, education, science, and history.	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) was applied to the extent possible during alternative route development.	▪ None	▪ None	▪ Few to no residual effects • No direct effects on the Alkali Draw WSA are anticipated. • Potential indirect effects on the Alkali Draw WSA include impacts on scenery during construction and reclamation. Also, there is the potential for decreased access during construction, with long-term improved access for recreationists and hunters.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
Other Management Areas							
▪ Conflict with any applicable adopted management prescription or goal of the	▪ Crosses the Steamboat Mountain Management Area, which is managed to protect heritage resources and enhance water	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) was applied to the extent possible	▪ Distribution lines that power mainline valves could occur in the Red Desert Watershed Management Area. In this area,	▪	▪ Few to no residual effects • Potential direct effects on the Steamboat Mountain Management Area include minor impacts on water	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and	▪ Not applicable

Table C1-12. Mitigation for Special Designations							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
affected land management agency	quality, vegetation, soil, and wildlife resources. Right-of-way crossings are allowed on a case-by-case basis. ▪ Crosses the Red Desert Watershed Management Area, which is managed to protect visual resources, watershed values, and wildlife resources. ▪ Crosses a Designated Development Area, which is a designated right-of-way corridor.	during alternative route development. ▪ Only below-ground facilities are permitted in the Red Desert Watershed Management Area and the Bureau of Land Management assumes no overhead facilities would be placed in the management area.	solar-powered mainline valves would be required instead of distribution lines, or the lines would be buried, thereby reducing above-ground facilities.		quality, vegetation, soil, and wildlife resources during construction and reclamation. • Potential direct effects on the Red Desert Watershed Management Area include minor impacts on visual resources, watershed values, and wildlife resources during construction and reclamation. • No direct effects on the Designated Development Area are anticipated.	localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	
Conservation Easements							
▪ Conflict with any applicable adopted management prescription or goal of the affected land management agency	▪ No conservation easements would be crossed by the Project. ▪ No impacts on management of conservation easements would be anticipated.	—	—	—	—	—	—

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-13. Mitigation for Transportation							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
Transportation and Access							
▪ Impacts on sufficiency of existing transportation system to handle anticipated increase in traffic (construction and ongoing maintenance) • Includes roads, railroads, airports, landing strips	▪ Impacts on the sufficiency or ability of the transportation system to handle anticipated traffic would be anticipated.	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to allow for alignment of pipeline or transmission lines to avoid or minimize impacts on resources. ▪ Agency-Required Mitigation Measure 3 (Avoid or Minimize Disturbance to Sensitive Soils and Vegetation) would limit ground disturbance related to new roads for the Project to reduce potential for erosion, compaction, or loss of soil-stabilizing vegetation.	▪ Agency-Required Mitigation Measure 5 (Overland Access) would avoid or minimize removal of surface soil and vegetation during construction of Project roads. ▪ Agency-Required Mitigation Measure 9 (Minimize New or Improved Access) would allow for closure of roads after construction to protect resources.	▪ Agency-Required Mitigation Measure 4 (Blend Road Cuts and Grading) would reduce visual contrast from construction of Project roads.	▪ Few to no residual effects are anticipated. • Minor, temporary impacts on the ability of the transportation system to handle traffic; effects would be localized.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor, temporary, and localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-14. Mitigation for Vegetation							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
Vegetation Communities							
▪ Removal of vegetation communities	▪ Crosses the following vegetation communities: • 8.5 miles of Barren/Sparsely Vegetated • 125.5 miles of Big Sagebrush • 4.3 miles of Developed/Disturbed • 0.7 mile of Grassland • 98 miles of Shrub/Shrub-Steppe	▪ None	▪ None	▪ Agency-Required Mitigation Measure 8 (Interim and Intense Reclamation) would be applied following construction to rectify the effects of construction by repairing, rehabilitating, or restoring the vegetation communities (would only be applied to big sagebrush and shrub-steppe vegetation communities in greater sage-grouse priority habitat management areas [PHMA]).	▪ Disturbance in Big Sagebrush or Shrub/Shrub-Steppe vegetation communities is anticipated to result in moderate residual impacts, as disturbance to these slow-growing vegetation communities could take decades to recover to pre-disturbance conditions. ▪ Low residual impacts are anticipated for all other vegetation communities, as recovery could occur in a shorter time-span.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects in Big Sagebrush or Shrub/Shrub-Steppe vegetation communities would be localized although long-term. Residual effects in other vegetation communities would be localized and short-term. The residual effects on vegetation communities do not warrant additional appropriate mitigation. (Note: Additional mitigation will be required in Big Sagebrush or Shrub/Shrub-Steppe vegetation communities that are GHMA and PHMA area [refer to Table C-19-a]). Also, residual effects on vegetation communities would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
▪ Introduction of noxious weeds	▪ Crosses the following vegetation communities: • 8.5 miles of Barren/Sparsely Vegetated • 125.5 miles of Big Sagebrush • 4.3 miles of Developed/Disturbed • 0.7 mile of Grassland • 98 miles of Shrub/Shrub-Steppe	▪ None	▪ Design Feature 13 (Vegetation Noxious Weeds) would require that noxious weed surveys be conducted prior to construction so that preventive management measures could be applied as warranted pursuant to the Project's Noxious Weed Management Plan. Vehicles also would be power washed and inspected. These measures would prevent or reduce transport of weed species during construction and would reduce the spread of weeds in special status plant habitat. ▪ Design Feature 14 (Vegetation General Maintenance) would be applied to avoid, reduce, and/or minimize the potential for the spread of invasive species.	▪ Agency-Required Mitigation Measure 8 (Interim and Intense Reclamation) would be applied following construction to rectify the effects of construction by repairing, rehabilitating, or restoring the vegetation communities (would only be applied to big sagebrush and shrub-steppe vegetation communities in greater sage-grouse PHMA).	▪ Low residual effects are anticipated although the increased risk of noxious weed invasion remains due to Project-related ground disturbance.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
▪ Altered hydrologic regimes, excessive erosion or dust deposition, decrease in attractiveness to pollinators	▪ Crosses the following vegetation communities: • 8.5 miles of Barren/Sparsely Vegetated • 125.5 miles of Big Sagebrush • 4.3 miles of Developed/Disturbed • 0.7 mile of Grassland • 98 miles of Shrub/Shrub-Steppe	▪ None	▪ Design Feature 5 (Roads – General Design) would be applied to areas with excessive grades (roads, road embankments, ditches, and drainages) to avoid areas with erodible soils. Special construction techniques would be used, where applicable. ▪ Design Feature 10 (Soils – Erosion Control) would be applied to provide permanent erosion-	▪ None	▪ Few to no residual effects • Minor, temporary increases in erosion or dust deposition and reduction in pollinators	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator	▪ Not applicable

Table C1-14. Mitigation for Vegetation							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
			control devices during Project construction. ▪ Design Feature 11 (Soils – Topsoil Handling) would be applied to ensure that topsoil from all excavation and construction activities would be salvaged and reapplied during reclamation. ▪ Design Feature 12 (Soils – Wet Soils during Construction) would be applied to construction activities when soils are wet.			have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	
Special Status Plants							
▪ Loss of special status plant species habitat and individuals, degradation of special status plant habitat through isolation and reduction of patch size	▪ Crosses the following special status plant modeled habitat: • 1.9 miles of Cedar Rim thistle • 26.7 miles of large-fruited bladderpod • 1.3 miles of Owl's Creek miners candle • 0.9 mile of persistent-sepal yellowcress • 14.3 miles of Porter's sagebrush • 9 miles of tufted twinpod • 0.6 mile of Ute ladies'-tresses	▪ Design Feature 4 (Sensitive Plant Species Survey) would be conducted to generate professional recommendations for mitigation and/or conservation measures to protect the species. The resulting mitigation and/or conservation measures would be incorporated into the plan of development. ▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route (micro-site), or apply alternative construction techniques.	▪ Agency-Required Mitigation Measure 3 (Minimizing Construction on Greater Slopes) would be applied to prevent soil loss in areas where slopes are between 15 and 24 percent. ▪ Agency-Required Mitigation Measure 7 (Seasonal Restrictions) would be applied to avoid ground-disturbing or disruptive activities associated with construction, operation, and maintenance of the Project during sensitive periods for plants.	▪ None	▪ No residual effects • Direct impacts on special status plants and habitats would be avoided through surveys to detect presence and avoidance of occupied habitat.	▪ No. No residual effects are anticipated.	▪ Not applicable
▪ Introduction of noxious weeds	▪ Crosses the following special status plant modeled habitat: • 1.9 miles of Cedar Rim thistle • 26.7 miles of large-fruited bladderpod • 1.3 miles of Owl's Creek miners candle • 0.9 mile of persistent-sepal yellowcress • 14.3 miles of Porter's sagebrush • 9 miles of tufted twinpod • 0.6 mile of Ute ladies'-tresses	▪ None	▪ Design Feature 13 (Vegetation Noxious Weeds) would require that noxious weed surveys be conducted prior to construction so that preventive management measures could be applied as warranted pursuant to the Project's Noxious Weed Management Plan. Vehicles also would be power washed and inspected. These measures would prevent or reduce transport of weed species during construction and would reduce the spread of weeds in special status plant habitat. ▪ Design Feature 14 (Vegetation General Maintenance) would be applied to avoid, reduce, and/or minimize the potential for the spread of invasive species.	▪ None	▪ Low residual effects are anticipated although the increased risk of noxious weed invasion remains due to Project-related ground disturbance.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
▪ Altered hydrologic regimes, excessive erosion or dust deposition, decrease in attractiveness to pollinators	▪ Crosses the following special status plant modeled habitat: • 1.9 miles of Cedar Rim thistle • 26.7 miles of large-fruited bladderpod • 1.3 miles of Owl's Creek miners candle	▪ None	▪ Design Feature 5 (Roads – General Design) would be applied to areas with excessive grades (roads, road embankments, ditches, and drainages) to avoid areas with erodible soils. Special	▪ None	▪ Few to no residual effects • Minor, temporary increases in erosion or dust deposition and reduction in pollinators	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects	▪ Not applicable

Table C1-14. Mitigation for Vegetation							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
	• 0.9 mile of persistent-sepal yellowcress • 14.3 miles of Porter's sagebrush • 9 miles of tufted twinpod • 0.6 mile of Ute ladies'-tresses		construction techniques would be used, where applicable. ▪ Design Feature 10 (Soils – Erosion Control) would be applied to provide permanent erosion-control devices during Project construction. ▪ Design Feature 11 (Soils – Topsoil Handling) would be applied to ensure that topsoil from all excavation and construction activities would be salvaged and reapplied during reclamation. ▪ Design Feature 12 (Soils – Wet Soils during Construction) would be applied to construction activities when soils are wet.			would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-15. Mitigation for Visual Resources							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
Scenery							
▪ Modification of high-quality, diverse, and rare or unique scenery (Class A or B) or interesting but not outstanding landscapes (Class B or C) and the resulting level of change (contrast) to their character	▪ Crosses 2.5 miles of Class A scenery with high sensitivity ▪ Crosses 34.9 miles of Class B scenery with high sensitivity ▪ Crosses 26.2 miles of Class B scenery with moderate sensitivity	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied where the Project could directly affect scenic values. This mitigation measure would be used to avoid placement of above-ground facilities in visually sensitive areas, and micro-siting of the alignment would reduce visual contrast introduced by the Project.	▪ Agency-Required Mitigation Measure 2 (Minimize Construction on Greater Slopes) would be applied in areas where the construction of access roads would require switchbacks and additional areas to be graded. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied where existing access would potentially need to be widened or upgraded for construction and maintenance. ▪ Agency-Required Mitigation Measure 4 (Blend Road Cuts and Grading) would be applied to grading in steep, rocky areas. ▪ Agency-Required Mitigation Measure 5 (Overland Access) would require contractors to drive over vegetation rather than clear the vegetation in the area. ▪ Agency-Required Mitigation Measure 6 (Minimizing Tree Clearing) would be applied in areas where the Project crosses overstory vegetation, such as pinyon juniper communities and riparian corridors.	▪ Agency-Required Mitigation Measure 8 (Interim and Intense Reclamation) would be applied in areas where the Project would generate long-term visual contrast.	▪ No high residual impacts on scenery would be anticipated ▪ 69.7 miles of moderate impacts on scenic quality would be anticipated from the Applicant's Proposed Action; predicted effects on the landscape scenery would include: • The appearance of a defined band of vegetative clearing and ground disturbance stretching across the generally flat to gently rolling landscapes • Vegetation clearing and ground disturbance within the Project right-of-way, resulting in hard edges through relatively dense sagebrush steppe vegetation ▪ The construction of access roads would also create linear clearings and ground disturbance, including defined edges through the existing vegetation. Proposed above-ground facilities would potentially affect scenery by introducing occasional clusters of geometric lines and forms into the landscape—in addition to distinct edges associated with vegetative clearing.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be moderate but most residual effects would be reduced over time. Long-term residual effects associated with the presence of Project facilities would be localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

Table C1-15. Mitigation for Visual Resources

Impact Indicator[1]	Initial Impacts (Agency Preferred Alternative)[2]	Strategy to Avoid, Minimize, and Rectify Impacts on the Resource			Residual Effects (Agency Preferred Alternative)[3]	Warrant Additional Mitigation?	Mitigation
		Avoidance[4]	Minimize[5]	Rectify/Restore[6]			Additional Mitigation
			▪ Agency-Required Mitigation Measure 9 (Minimize New or Improved Accessibility) would be applied to construction roads but not to maintenance roads.				
Views							
▪ Modification to views from key observation points (KOP) that would create visible contrast	▪ Modification of views from KOPs: • 0.0–0.5 mile = 45.8 miles • 0.5–1.0 mile = 7.8 miles • 1.0 mile–2 miles = 11.7 miles • 2.0–3.0 miles = 11.6 miles • 3.0 or more miles = 163.7 miles	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied where the Project could directly affect scenic values. This mitigation measure would be used to avoid placement of above-ground facilities in visually sensitive areas, and micro-siting of the alignment would reduce visual contrast introduced by the Project.	▪ Agency-Required Mitigation Measure 2 (Minimize Construction on Greater Slopes) would be applied in areas where the construction of access roads would require switchbacks and additional areas to be graded. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied where existing access would potentially need to be widened or upgraded for construction and maintenance. ▪ Agency-Required Mitigation Measure 4 (Blend Road Cuts and Grading) would be applied to grading in steep, rocky areas. ▪ Agency-Required Mitigation Measure 5 (Overland Access) would require contractors to drive over vegetation rather than clear the vegetation in the area. ▪ Agency-Required Mitigation Measure 6 (Minimizing Tree Clearing) would be applied in areas where the Project crosses overstory vegetation, such as pinyon juniper communities and riparian corridors. ▪ Agency-Required Mitigation Measure 9 (Minimize New or Improved Accessibility) would be applied to construction roads but not to maintenance roads.	▪ Agency-Required Mitigation Measure 8 (Interim and Intense Reclamation) would be applied in areas where the Project would generate long-term visual contrast.	▪ From KOP P-2 Green River, the Agency Preferred Alternative would present users with a linear clearing of vegetation, which is typical of pipeline construction, maintenance, and operation, through the riparian corridor adjacent to the Green River. The Agency Preferred Alternative would cross the Green River in an agricultural area on the east side of the river. Due to the vegetation type in the area, this clearing would revegetate much sooner than the northern crossing where natural vegetation is found. Through application of agency-required mitigation measures, including boring under the river and riparian vegetation, the effects on views would be minimized to the extent practicable. ▪ From KOP RS-1 Red Desert Backcountry Byway, the Agency Preferred Alternative would introduce a wide geometric band that would parallel a large portion of the Red Desert Backcountry Byway. ▪ From KOP RS-2 U.S. Highway 191, the Agency Preferred Alternative would introduce a similar type of geometric band to the landscape associated with the typical construction, maintenance, and operation of pipeline projects, but the Project would be partially screened due to topography. ▪ From KOP L-1 U.S. Highway 287, in a highly modified landscape, the Agency Preferred Alternative would affect views for a short duration. ▪ From KOP C-1 U.S. Highway 20, the Agency Preferred Alternative would affect views for a short duration due to the perpendicular crossing of the highway in a highly modified landscape due to the remnant geometric bands created by other utility corridors.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be moderate but most residual effects would be reduced over time. Long-term residual effects associated with the presence of Project facilities would be localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-16. Mitigation for Water Resources							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
Water Resources							
▪ Impacts on the quality of surface water from erosion or hazardous materials associated with construction or operation	▪ Temporary removal of riparian vegetation, grading of stream banks, and the placement of fill materials (e.g., culverts, stream-crossing structures, or rip-rap) could result in increased sedimentation of streams without engineering controls during and after construction. ▪ Indirect effects from these activities could include alteration of the pattern, profile, or dimension of streams and increased destabilization of soils. Transport of fugitive dust and erosion may result in discharge of sediment into water resources. An increase in sedimentation indirectly related to surface disturbance could degrade water quality and the ecological function of water resources, including streams, wetlands, and riparian areas.	▪ The flume and trench method would be used in most situations where there is flowing water. ▪ Monitoring and trench inspection areas will be defined in a monitoring and treatment plan submitted to the Bureau of Land Management, as the lead federal agency, for State Historic Preservation Office and consulting party review and concurrence. ▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to avoid or reduce impacts on surface water and groundwater resources, streams, wetlands, and riparian areas and springs. ▪ The Applicant proposes to use Horizontal Directional Drilling (HDD) under Spring Creek, the Green River, the Big Sandy River, and the Sweetwater River to avoid impacts on riparian and fish habitats, which would also avoid impacts on these water resources. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied where soils and vegetation are particularly sensitive, including areas within 500 feet (153 meters) of streams, wetlands, water, and riparian vegetation communities. ▪ Design Feature 12 (Soils – Wet Soils during Construction) requires that construction activities would not occur when soils are wet, which would minimize disturbance to riparian vegetation, which would, in turn, minimize erosion and runoff and sedimentation of surface waters. ▪ Design Feature 25 (Waste Management Disposal) would be applied to ensure that waste would be properly containerized and removed periodically for disposal at appropriate off-site permitted disposal facilities.	▪ Design Feature 5 (Roads – General Design) would be applied to areas with excessive grades (roads, road embankments, ditches, and drainages) to avoid areas with soils susceptible to erosion. Special construction techniques would be used, where applicable. Limiting soil erosion would minimize runoff and sedimentation. ▪ Design Feature 6 (Access Roads – General Design) would be applied to ensure that access roads would be located to follow natural contours where possible and to minimize side hill cuts. Limiting soil erosion would minimize runoff and sedimentation. ▪ Design Feature 10 (Soils – Erosion Control) would be applied to provide permanent erosion-control devices during Project construction. Limiting soil erosion would minimize runoff and sedimentation. ▪ Design Feature 21 (Mitigation Measure Development) would be applied to establish mitigation measures, as needed, based on the mutual agreement of Denbury and the BLM, to address changing conditions or requirements within the Project area throughout the operational phase. Measures may be developed to minimize effects on the Project. ▪ Design Feature 27 (Water – Stormwater Pollution Prevention Plan) would be applied prior to commencement of construction to ensure that proper sediment and erosion control and reporting procedures are followed.	▪ Design Feature 9 (Roads Reclamation) would be applied to ensure that abandoned roads and roads that are no longer used would be recontoured and revegetated. ▪ Design Feature 11 (Soils – Topsoil Handling) would be applied to ensure that topsoil from all excavation and construction activities would be salvaged and reapplied during reclamation.	▪ With the application of agency-required mitigation measures discussed, only minor, short-term residual effects on surface water resources would be anticipated as a result of surface disturbance during construction and the potential for a temporary increase in sedimentation and erosion.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minimal, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

Table C1-16. Mitigation for Water Resources							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
		▪ Design Feature 26 (Waste Management Wastewater) would be applied to any wastewater generated in association with temporary, portable sanitary facilities and ensures that the wastewater is disposed of in accordance with applicable state and local laws and regulations. ▪ Design Feature 28 (Water – Road Drainage) would be applied to ensure that existing drainage systems would not be altered, especially in sensitive areas, such as areas with erodible soils or steep slopes. ▪ Design Feature 29 (Waters – Water Bodies and Wetlands) would be applied to avoid waters of the U.S., including wetlands, to the maximum extent practicable. ▪ Design Feature 30 (Waters – Water Bodies and Wetlands [Construction]) would be applied to ensure that any construction that occurs in or adjacent to wetlands and streams would use Applicant-committed BMPs (refer to Applicant-committed environmental protection measures listed to protect surface water quality and to minimize impacts on those resources). ▪ Design Feature 31 (Water – Control of Aquatic and Invasive Species) would be applied to ensure that all construction equipment that contacts water would be cleaned using high-pressure (minimum 3000 PSI) hot water (140 degrees F).					
▪ Water depletions due to consumptive water use during construction	▪ Approximately 80 AFT (26,000,000 gallons) of water is needed for hydrostatic testing. ▪ Approximately 4.6 AFT (1,500,000 gallons) of water is needed for fugitive dust control for every 10 miles of pipeline construction or access road use. ▪ Approximately 15.3 AFT (5,000,000 gallons) of water is needed during the construction of the Sweetening Plant. ▪ It is anticipated that approximately 164 AFT of water will be needed for fugitive dust control. ▪ Once a route is selected, water source(s) capable of providing a	▪ The rights for use of water for hydrostatic testing and fugitive dust control purposes would be obtained, as necessary, prior to construction, through permits or purchase contracts with owners of valid existing water rights. ▪ Water would be obtained from a permitted source for mixing with bentonite during directional drilling at the HDD crossings.	▪ None.	▪ None.	▪ No effects from water depletions are anticipated.	▪ No. No effects from water depletions are anticipated.	▪ Not applicable

Table C1-16. Mitigation for Water Resources							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
	sufficient volume of water of acceptable water quality will be identified by the owner and proper permission(s) for water use will be obtained through the State of Wyoming Water Rights permitting process prior to beginning construction. This requirement will be a condition of the Record of Decision.						
Groundwater Resources							
▪ Impacts on groundwater resources ▪ Down-hole releases from the injection well due to casing ruptures, casing erosion or inadequate installation practices ▪ Interruption or impacts on spring flow	▪ Groundwater surface discharges, such as springs, are important water resources in the open and arid ecosystem in Wyoming. Springs are typically found along slopes where shallow groundwater intersects the land surface. If construction intersects shallow groundwater that contributes to the flow of streams, the potential long-term indirect effects on springs include alteration, disruption, and destruction of the flow of the springs by construction activities and placement of the pipeline within the hydrologic footprint of these features.	▪ The two hydrogen sulfide injection wells will be drilled to maximum depths of 19,860 feet below ground surface targeting injection zones in the Madison Limestone and Big Horn Dolomite (Appendix A of the Plan of Development) and will be entirely encased with multiple layers of protective cement sleeving and liners to protect shallow and deep aquifers as required by the underground injection control program (administered by the Wyoming Oil and Gas Conservation Commission) for Class II injection wells. ▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to avoid or reduce impacts on surface water and groundwater resources, streams, wetlands and riparian areas and springs. ▪ Sensitive groundwater areas would be avoided during construction. ▪ The Applicant proposes to use HDD under Spring Creek, the Green River, the Big Sandy River, and the Sweetwater River to avoid impacts on riparian and fish habitat, which would also avoid impacts on these water resources. ▪ Design Feature 25 (Waste Management Disposal) would be applied to ensure that waste would be properly containerized and removed periodically for disposal at appropriate off-site permitted disposal facilities. ▪ Design Feature 26 (Waste Management Wastewater) would be applied to any wastewater generated in association with temporary, portable sanitary facilities and	▪ Design Feature 21 (Mitigation Measure Development) would be applied to establish mitigation measures, as needed, based on the mutual agreement of Denbury and the BLM, to address changing conditions or requirements within the Project area throughout the operational phase. Measures may be developed to minimize effects on the Project. ▪ Design Feature 27 (Water – Stormwater Pollution Prevention Plan) would be applied prior to commencement of construction to ensure that proper sediment and erosion control and reporting procedures are followed.	▪ None	▪ With the application of agency-required mitigation measures discussed, the potential for long-term impacts on the springs would be avoided or minimized. Based on topographic analysis and the position of the remaining springs relative to the pipeline, the possibility of affecting water quality or quantity at the remaining springs identified in this EIS is low.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minimal, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

Table C1-16. Mitigation for Water Resources							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
		would ensure that the wastewater is disposed of in accordance with applicable state and local laws and regulations.					

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-17. Mitigation for Wetlands and Riparian Areas							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
Wetlands and Riparian Areas							
▪ Increased sedimentation of wetlands from temporary removal of riparian vegetation and/or the placement of fill materials ▪ Modifications to hydrology, vegetation, or hydric soils ▪ Increased potential for removal of vegetation and increased discharge indirectly increasing the potential for erosion-caused sedimentation from the disturbance of soils ▪ Discharge of sediment to wetlands and riparian resources from mobilization of fugitive dust and disturbed soils as a result of ground-disturbing activities, indirectly degrading the function of wetlands and riparian areas ▪ Vegetation clearing resulting in indirect effects on the functional capacity of wetlands, including water quality, and an increase in transported sediment to wetland and other waters	▪ Temporary removal of riparian vegetation, the grading of stream banks, and the placement of fill materials (e.g., culverts, stream-crossing structures, or rip-rap) could result in increased sedimentation and alteration of the functional capacity of wetlands and riparian areas and streams without engineering controls during and after construction.	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to avoid or reduce impacts on surface water and groundwater resources, streams, wetlands and riparian areas, and springs. ▪ The Applicant proposes to use horizontal directional drilling under Spring Creek, the Green River, the Big Sandy River, and the Sweetwater River to avoid impacts on riparian areas and fish habitat. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied where soils and vegetation are particularly sensitive, including areas within 500 feet (153 meters) of streams, wetlands, water, and riparian vegetation communities. ▪ Design Feature 12 (Soils – Wet Soils during Construction) prevents construction activities when soils are wet, which would minimize disturbance to riparian vegetation, which would in turn minimize erosion and runoff and sedimentation of wetlands and riparian areas. ▪ Design Feature 26 (Waste Management Wastewater) would be applied to any wastewater generated in association with temporary, portable sanitary facilities and would ensure that wastewater is disposed of in accordance	▪ Design Feature 5 (Roads – General Design) would be applied to areas with excessive grades (roads, road embankments, ditches, and drainages) to avoid areas with soils susceptible to erosion. Special construction techniques would be used, where applicable. Limiting soil erosion will minimize runoff and sedimentation. ▪ Design Feature 6 (Access Roads – General Design) would be applied to ensure that access roads would be located to follow natural contours where possible and to minimize side hill cuts. Limiting soil erosion would minimize runoff and sedimentation. ▪ Design Feature 10 (Soils – Erosion Control) would be applied to provide permanent erosion-control devices during Project construction. Limiting soil erosion would minimize runoff and sedimentation. ▪ Design Feature 21 (Mitigation Measure Development) would be applied to establish mitigation measures, as needed, based on the mutual agreement of Denbury and the BLM, to address changing conditions or requirements within the Project area throughout the operational phase. Measures may be developed to minimize effects on the Project. ▪ Design Feature 27 (Water – Stormwater Pollution Prevention Plan) would be applied prior to commencement of construction to ensure that proper sediment and	▪ Design Feature 9 (Roads Reclamation) would be applied to ensure that abandoned roads and roads that are no longer used would be recontoured and revegetated. ▪ Design Feature 11 (Soils – Topsoil Handling) would be applied to ensure that topsoil from all excavation and construction activities would be salvaged and reapplied during reclamation. ▪ Agency-Required Mitigation Measure 8 (Interim and Intense Reclamation) would be applied for intense reclamation (beyond reseeding) to achieve management objectives or prescriptions for riparian areas or wetlands.	▪ Few to no residual effects are anticipated. ● Implementation of agency-required mitigation measures would reduce residual impacts on wetlands to low although some temporary disturbance would be anticipated.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minimal, localized, and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

Table C1-17. Mitigation for Wetlands and Riparian Areas							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
		with applicable state and local laws and regulations. ▪ Design Feature 28 (Water – Road Drainage) would be applied to ensure that existing drainage systems would not be altered, especially in sensitive areas, such as erodible soils or steep slopes. ▪ Design Feature 29 (Waters – Water Bodies and Wetlands) would be applied to avoid waters of the U.S., including wetlands, to the maximum extent practicable. ▪ Design Feature 30 (Waters – Water Bodies and Wetlands [Construction]) would be applied to ensure that any construction that occurs in or adjacent to wetlands and streams would use Applicant-committed BMPs. ▪ Design Feature 31 (Water – Control of Aquatic and Invasive Species) would be applied to ensure that all construction equipment that contacts water would be cleaned using high-pressure (minimum 3,000 PSI) hot water (140 degrees F).	erosion control and reporting procedures are followed. ▪ Agency-Required Mitigation Measure 6 (Minimizing Tree Clearing) would be applied to minimize the removal of trees in the right-of-way to protect sensitive habitat to the extent practicable. Trees and other vegetation would be removed selectively (e.g., edge feathering) to blend the edge of the right-of-way into adjacent vegetation patterns, as practicable and appropriate. This agency-required mitigation measure would be applied to riparian vegetation communities.				

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-18. Mitigation for Wild Horses and Burros							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
Wild Horses and Burros							
▪ Displacement, disturbance, or increased mortality of wild horses and burros; impacts on active foaling areas	▪ Crosses 92.8 miles of wild horse management area	▪ None	▪ Design Feature 3 (Wildlife and Livestock – Vehicles Collisions) would limit speeds of Project-related vehicles to 35 miles per hour to ensure safe and efficient traffic flow and to reduce wildlife collisions. ▪ Design Feature 23 (Noise – Construction) includes use of sound-control devices on construction equipment to reduce sound-control audible noise that could result in wildlife disturbance. ▪ During construction, dirt escapement ramps would be used in trenches to aid an animal if it were to fall in.	▪ Design Feature 9 (Roads Reclamation) would result in closing, recontouring, and reclamation of roads that are no longer needed, which would reduce long-term disturbance to wild horses and burros.	▪ Few to no residual effects • Minor, temporary displacement or disturbance of wildlife horses and burros • No increase in mortality anticipated	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

Table C1-18. Mitigation for Wild Horses and Burros							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
▪ Permanent or temporary loss of seasonal or year-round habitat; potential spread of noxious and invasive weeds	▪ Crosses 92.8 miles of wild horse management area	▪ None	▪ Design Feature 13 (Vegetation Noxious Weeds) requires that noxious weed surveys be conducted prior to construction so that preventive management measures could be applied as warranted pursuant to the Project's Noxious Weed Management Plan. Vehicles also would be power washed and inspected. These measures would prevent or reduce the transport of weed species during construction and reduce the spread of weeds in wild horse foraging areas.	▪ Design Feature 9 (Roads Reclamation) would result in closing, recontouring, and reclamation of roads that are no longer needed, which would restore or rectify short-term loss of habitat associated with access roads. ▪ Design Feature 14 (Vegetation General Maintenance) requires that once reclamation is complete, weed surveys would be conducted on a regular basis. Access roads would be monitored for noxious weeds and would be treated as outlined in the Noxious Weed Management Plan.	▪ Few to no residual effects • Minor, temporary reduction of habitat, forage availability for wild horses and burros	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
▪ Interference with wild horse and burro management	▪ Crosses 92.8 miles of wild horse management area	▪ None	▪ None	▪ None	▪ All residual effects are estimated to be minor and temporary and will not conflict with management of wild horse and burros	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-19. Mitigation for Wildlife – Greater Sage-Grouse							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
Greater Sage-Grouse							
▪ Permanent and temporary habitat loss ▪ Exceedance of DDCT disturbance cap	▪ The Project crosses the following habitat: • 240.6 miles of general habitat management areas (GHMAs) • 121.8 miles of priority habitat management areas (PHMAs) • 35.1 miles of Sagebrush Focal Area (SFAs) • Segment 2A would result in 4.28% percent disturbance within PHMA	▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied so that only existing access roads would be used in PHMA and SFAs to minimize surface disturbance in these areas.	▪ Agency-Required Mitigation Measure 3 ▪ Agency-Required Mitigation Measure 10 (Limit Accessibility in Sensitive Habitat) would require that sensitive habitats are gated or otherwise blocked in cooperation with the appropriate land management agencies to limit public access.	▪ Agency-Required Mitigation Measure 8 (Interim or Intense Reclamation) would be applied where re-establishment of vegetation has been shown or is expected to be difficult and intense reclamation would be required (typically) for locations where higher impacts on habitats have been identified (would only be applied to big sagebrush and shrub steppe vegetation communities in greater sage-grouse PHMA). • The entirety of the pipeline and all ground-disturbing activities would eventually be reclaimed.	▪ Few residual effects. Habitat loss would largely be avoided through reclamation and habitat avoidance; however, reclamation will take years, short-term removal of existing vegetation could contribute to temporary habitat loss.	▪ Yes. Habitat loss would largely be avoided through reclamation (Agency-Required Mitigation Measure 8) and minimizing habitat disturbance (Agency-Required Mitigation Measures 3 and 10). However, the nature and extent of residual effects associated with disturbance from Project activities during construction (i.e., in the short-term) that were identified through the NEPA process warrant additional appropriate mitigation to mitigate for temporary habitat loss. Without additional appropriate mitigation, the residual effects would inhibit achieving Wyoming	▪ Standard: Net conservation gain ▪ Objective 1: To recompense for habitat loss or conversion ▪ Measure(s): Purchase additional habitat of same quality in the same region; a mitigation banking program could be pursued.

Table C1-19. Mitigation for Wildlife – Greater Sage-Grouse							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
						ARMPA objectives and, therefore, warrant additional mitigation.	
▪ Habitat fragmentation	▪ While the Project will ultimately be a buried pipeline right-of-way, subject to reclamation, removal of the existing vegetation would contribute, possibly, to habitat fragmentation.	▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied so that only existing access roads would be used in PHMA and SFAs to minimize surface disturbance in these areas.	▪ Agency-Required Mitigation Measure 3 ▪ Agency-Required Mitigation Measure 10 (Limit Accessibility in Sensitive Habitat) would require that sensitive habitats are gated or otherwise blocked in cooperation with the appropriate land management agencies to limit public access.	▪ Agency-Required Mitigation Measure 8 (Interim or Intense Reclamation) would be applied where re-establishment of vegetation has been shown or is expected to be difficult and intense reclamation would be required (typically) for locations where higher impacts on habitats have been identified (would only be applied to big sagebrush and shrub steppe vegetation communities in greater sage-grouse PHMA). ▪ The entirety of the pipeline and all ground-disturbing activities would eventually be reclaimed.	▪ Few to no residual effects. Habitat loss would largely be avoided through reclamation and habitat avoidance; however, reclamation will take years, short-term removal of existing vegetation could contribute to temporary habitat loss, and possibly, habitat fragmentation.	▪ No. Habitat fragmentation would largely be avoided through reclamation (Agency-Required Mitigation Measure 8) and minimizing habitat disturbance (Agency-Required Mitigation Measures 3 and 10). The nature and extent of residual effects associated with disturbance from Project activities during construction (i.e., in the short-term) that were identified through the NEPA process do not warrant additional appropriate mitigation to mitigate for temporary habitat fragmentation. Residual effects would not inhibit achieving compliance with laws, regulations, and/or policies.	▪ Not applicable
▪ Mortality of adult birds, nests, eggs, or young	▪ The Project crosses the following habitat: • 240.6 miles of GHMA • 121.8 miles of PHMA • 35.1 miles of SFAs	▪ Design Feature 1 (Preconstruction Surveys for Sensitive Species) would require that field surveys be conducted to determine presence/absence of sensitive species. ▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route (micro-site), or apply alternative construction techniques. The Applicant has committed to using horizontal directional drilling techniques (HDD) or micrositing in No Surface Occupancy areas to comply with the Wyoming Approved Resource Management Plan Amendment for Greater Sage-grouse (ARMPA). ▪ Agency-Required Mitigation Measure 7 (Seasonal Restrictions) would be applied to avoid ground-disturbing or disrupting activities associated with construction, operation, and maintenance of the Project during sensitive periods for wildlife.	▪ Design Feature 2 (Wildlife Disturbance and Harassment) would require that all construction personnel be instructed to avoid harassment and disturbance of wildlife. ▪ Design Feature 3 (Wildlife Vehicle Conflicts) would require that all construction personnel adhere to a 35 mph speed limit to avoid wildlife collisions and disturbance. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied so that only existing access roads would be used in areas where soils and vegetation are particularly sensitive to disturbance. ▪ Agency-Required Mitigation Measure 10 (Limit Accessibility in Sensitive Habitat) would require that sensitive habitats are gated or otherwise blocked in cooperation with the appropriate land management agencies to limit public access.	▪ None	▪ Few to no residual effects. Mortality from vehicle collisions is possible but unlikely due to enforcement of a speed limit and Project activities outside of sensitive habitat and periods.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that mortality from vehicle collisions is possible but unlikely due to enforcement of a speed limit and Project activities outside of sensitive habitat and periods and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving Wyoming ARMPA objectives. Finally, residual effects related to this resource indicator (mortality of adult birds, nests, eggs, or young) have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
▪ Migration disruption or obstruction	▪ The Project crosses the following habitat: • 240.6 miles of GHMA • 121.8 miles of PHMA • 35.1 miles of SFAs	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route	▪ Agency-Required Mitigation Measure 10 (Limit Accessibility in Sensitive Habitats) would require that sensitive habitats are gated or otherwise blocked in cooperation with the appropriate land	▪ None	▪ No residual effects. Disturbance on migration routes would not likely prevent migration.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that disturbance on migration routes would not likely prevent migration and, therefore, do not warrant	▪ Not applicable

Table C1-19. Mitigation for Wildlife – Greater Sage-Grouse							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
		(micro-site), or apply alternative construction techniques. The Applicant has committed to using HDD or micrositing in No Surface Occupancy areas to comply with the Wyoming ARMPA. ▪ Agency-Required Mitigation Measure 7 (Seasonal Restrictions) is a condition of plan of development (POD) approval that would be applied to avoid surface-disturbing or disrupting activities associated with construction, operation, and maintenance of the Project during sensitive periods for migration routes.	management agencies to limit public access. ▪ Design Feature 2 (Wildlife Disturbance and Harassment) would require that all construction personnel be instructed to avoid harassment and disturbance of wildlife. ▪ Design Feature 3 (Wildlife Vehicle Conflicts) would require that all construction personnel adhere to a 35 mph speed limit to avoid wildlife collisions and disturbance.			additional appropriate mitigation. Also, residual effects would not inhibit achieving Wyoming ARMPA objectives. Finally, residual effects related to this resource indicator (migration disruption or obstruction) have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	
▪ Behavioral modifications affecting use of habitat resulting in displacement or disruption of reproduction, foraging, and predation (indirect effects)	▪ Disturbance from Project activities could result in displacement into less suitable habitat for foraging, nesting, and cover.	▪ Design Feature 1 (Preconstruction Surveys for Sensitive Species) would require that field surveys be conducted to determine presence/absence of sensitive species. ▪ Design Feature 2 (Wildlife Disturbance and Harassment) would require that all construction personnel adhere to a 35 mph speed limit to avoid wildlife collisions and disturbance. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would require that only existing access roads be used in PHMA and SFAs to minimize surface disturbance in these areas. ▪ Agency-Required Mitigation Measure 7 (Seasonal Restrictions) is a condition of POD approval that would be applied to avoid surface-disturbing or disrupting activities associated with construction, operation, and maintenance of the Project during sensitive periods for wildlife and plants. ▪ In accordance with the Wyoming Approved Resource Management Plan Amendments (ARMPA): New Project noise levels associated with the Sweetening Plant construction, either individual or cumulative, should not exceed 10 decibel, A-weighted (dBA [as measured by L50])	▪ Agency-Required Mitigation Measure 10 (Limit Accessibility in Sensitive Habitats) would be applied to gate or otherwise block sensitive habitats in cooperation with the appropriate land management agencies to limit public access. ▪ Design Feature 3 (Wildlife Vehicle Conflicts) would require that all construction personnel adhere to a 35 mph speed limit to avoid wildlife collisions and disturbance.	▪ None	▪ No residual effects. Behavioral modification could occur from disturbance from Project activities, but would be minimized through limiting accessibility to sensitive habitat and avoiding harassment and disturbance. ▪ In contrast to other types of energy development, cross-country pipelines are constructed in a number of months and have short-term effects related to construction activity. There are studies (Holloran, Walker) that state that 3 to 4 years of persistent activity are needed to cause lek inactivity. And, there is little activity along the pipeline during operation.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that behavioral modification could occur from disturbance from Project activities, but would be minimized through limiting accessibility to sensitive habitat (Agency-Required Mitigation Measures 3 and 10) and avoiding harassment and disturbance (Design Features 2 and 3). Therefore, compensatory mitigation is not warranted. Also, residual effects would not inhibit achieving Wyoming ARMPA objectives. Finally, residual effects related to this resource indicator (behavioral modifications affecting use of habitat) have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

Table C1-19. Mitigation for Wildlife – Greater Sage-Grouse							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
		above baseline noise at the perimeter of the lek from 6:00 p.m. to 8:00 a.m. during the breeding season (March 1–May 15). Design Feature 2 (Wildlife Disturbance and Harassment) would require that all construction personnel be instructed to avoid harassment and disturbance of wildlife.					
▪ Increased avian presence and predation (indirect effects)	▪ Short-term loss of cover from construction of the pipeline could result in increased predation (i.e., creation of a corridor for predators). Also, overhead distribution lines to mainline valves (MLVs) could provide perching opportunities and the potential for increase in avian predation.	▪ The Applicant has committed to the use of solar-powered MLVs instead of overhead distribution lines in PHMA to avoid impacts on greater sage-grouse. ▪ For any MLVs located in PHMA, GRSG safe- fences and perch deterrents would be used.	▪ None	▪ Agency-Required Mitigation Measure 8 (Interim or Intense Reclamation) would be applied where re-establishment of vegetation has been shown or is expected to be difficult and intense reclamation would be required (typically) for locations where higher impacts on habitats have been identified (would only be applied to big sagebrush and shrub steppe vegetation communities in greater sage-grouse PHMA). ▪ The entirety of the pipeline and all ground-disturbing activities would eventually be reclaimed.	▪ The MLVs (in GHMA; Applicant will use solar-powered MLVs in PHMA) may provide perching opportunities and the potential for increase in avian predation. ▪ The short-term loss of cover from construction of the pipeline could result in increased predation (i.e., creation of a corridor for predators until interim or intense reclamation (Agency-Required Mitigation Measure 8). This would be most likely in areas where the pipeline does not follow existing disturbance.	▪ No. While the MLVs (i.e., in GHMA; the Applicant will use solar-powered MLVs in PHMA) could provide perching opportunities and the potential for increase in avian predation and the short-term loss of cover from construction of the pipeline could result in increased predation (i.e., creation of a corridor for predators until interim or intense reclamation (Agency-Required Mitigation Measure 8), the nature and extent of residual effects associated with the presence of distribution lines to MLVs in GHMA that were identified through the NEPA process do not warrant additional appropriate mitigation to mitigate for the resulting increased avian presence from introduced perching opportunities. Interim and intense reclamation (Agency-Required Mitigation Measure 8) in areas where the pipeline does not follow existing disturbance will be sufficient to restore/rectify short-term loss of cover and avoid or minimize increased predation from the creation of a corridor for predators. Thus, compensatory mitigation for this type of indirect effect is not warranted to achieve Wyoming ARMPA objectives.	▪ Not applicable
▪ Decreased productivity and survival (indirect effects)	▪ Disturbance from Project activities could result in habitat loss or conversion due to surface disturbance in decreased productivity and survival	▪ Agency-Required Mitigation Measure 7 (Seasonal Restrictions) is a condition of POD approval that would be applied to avoid surface-disturbing or disrupting activities associated with construction, operation, and maintenance of the Project during sensitive periods for wildlife and plants. ▪ In accordance with the Wyoming ARMPA: New Project noise levels associated with the Sweetening Plant construction, either individual or cumulative, should not	▪ None	▪ None	▪ The presence of the pipeline should not decrease nest success or hen survival. ▪ Habitat loss or conversion due to surface disturbance as an indirect effect, as it could cause the population to respond to these changes.	▪ No. The presence of the pipeline should not decrease nest success or hen survival. Habitat loss or conversion due to surface disturbance, as an indirect effect, could cause the population to respond to these changes. However, the nature and extent of residual effects associated with disturbance from Project activities during construction that were identified through the NEPA process do not warrant compensatory mitigation.	▪ Not applicable

Table C1-19. Mitigation for Wildlife – Greater Sage-Grouse							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
		exceed 10 dBA (as measured by L50) above baseline noise at the perimeter of the lek from 6:00 p.m. to 8:00 a.m. during the breeding season (March 1–May 15). Design Feature 2 (Wildlife Disturbance and Harassment) would require that all construction personnel be instructed to avoid harassment and disturbance of wildlife.					

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-20. Mitigation for Wildlife – Bird Species							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
Raptors and Other Migratory Birds, including Special Status Species							
▪ Permanent and temporary loss of habitat or habitat fragmentation	▪ The Project crosses the following habitat: • U.S. Fish and Wildlife Service (USFWS)-mapped yellow-billed cuckoo Area of Influence • 15.7 miles of bald eagle breeding habitat • 9.6 miles of bald eagle wintering habitat • 297.9 miles of golden eagle breeding habitat • 8.5 miles of loggerhead shrike habitat • 72.0 miles of long-billed curlew habitat • 152.7 miles of mountain plover habitat • 235.4 miles of sagebrush sparrow habitat • 28.6 miles of sage thrasher habitat ▪ The Project crosses within 1 mile of the following raptor nests: • 6 American kestrel nests • 12 burrowing owl nests • 16 ferruginous hawk nests • 4 golden eagle nests • 5 great horned owl nests • 1 northern harrier nest • 6 prairie falcon nests • 14 red-tailed hawk nests • 3 Swainson's hawk nests	▪ Design Feature 1 (Preconstruction Surveys for Sensitive Species) would require that field surveys be conducted to determine presence or absence of sensitive species. ▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route (micro-site), or apply alternative construction techniques.	▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied so that only existing access roads would be used in areas where soils and vegetation are particularly sensitive to disturbance. ▪ Ground disturbance would be limited to approved, staked areas. ▪ Whenever possible, grading would be limited to help preserve vegetation and to facilitate reclamation success. ▪ Design Feature 6 (Access Road Design**)** would be applied so that slope cut and fill would be minimized to reduce ground disturbance and potential habitat fragmentation.	▪ Agency-Required Mitigation Measure 8 (Interim or Intense Reclamation) would be applied where re-establishment of vegetation has been shown to be difficult, or is expected to be difficult, and intense reclamation would be required (typically) for locations where higher impacts on habitats have been identified (would only be applied to big sagebrush and shrub steppe vegetation communities in greater sage-grouse priority habitat management areas [PHMAs]).	▪ Low residual effects would result from temporary habitat loss and fragmentation.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

Table C1-20. Mitigation for Wildlife – Bird Species							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
▪ Mortality of adult birds, nests, eggs, or young	▪ See permanent and temporary loss of habitat or habitat fragmentation	▪ Design Feature 1 (Preconstruction Surveys for Sensitive Species) – would require that field surveys be conducted to determine presence or absence of sensitive species. ▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route (micro-site), or apply alternative construction techniques. ▪ Agency-Required Mitigation Measure 7 (Seasonal Restrictions) would be applied to avoid ground-disturbing or disrupting activities associated with construction, operation, and maintenance of the Project during sensitive periods for wildlife.	▪ Design Feature 2 (Wildlife Disturbance and Harassment) would require that all construction personnel be instructed to avoid harassment and disturbance of wildlife. ▪ Design Feature 3 (Wildlife Vehicle Conflicts) would require that all construction personnel adhere to a 35 mph speed limit to avoid wildlife collisions and disturbance. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied so that only existing access roads would be used in areas where soils and vegetation are particularly sensitive to disturbance. ▪ Agency-Required Mitigation Measure 10 (Limit Accessibility in Sensitive Habitat) would be applied to gate or otherwise block sensitive habitats, in cooperation with the appropriate land management agencies, to limit public access. ▪ The Project design and construction will follow Avian-Safe Design Standards for substations and power lines, which adhere to the Avian Power Line Interaction Committee's Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 and PacifiCorp's Avian Protection Plan(s).	–	▪ Low residual effects. Mortality may occur, but would be expected to be relatively rare and would not limit the long-term sustainability of populations.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be rare and localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
▪ Behavioral modifications affecting use of habitat resulting in displacement or disruption of reproduction, foraging, and predation	▪ See permanent and temporary loss of habitat or habitat fragmentation	▪ Design Feature 1 (Preconstruction Surveys for Sensitive Species) would require that field surveys be conducted to determine the presence or absence of sensitive species. ▪ Agency-Required Mitigation Measure 7 (Seasonal Restrictions) would be applied, as a condition of the plan of development approval, to avoid ground-disturbing or disrupting activities associated with construction, operation, and maintenance of the Project during sensitive periods for wildlife and plants. ▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route	▪ Agency-Required Mitigation Measure 10 (Limit Accessibility in Sensitive Habitats) would be applied to gate or otherwise block sensitive habitats in cooperation with the appropriate land management agencies to limit public access. ▪ Design Feature 2 (Wildlife Disturbance and Harassment) would require that all construction personnel be instructed to avoid harassment and disturbance of wildlife. ▪ Design Feature 3 (Wildlife Vehicle Conflicts) would require that all construction personnel adhere to a 35 mph speed limit to avoid wildlife collisions and disturbance. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would be applied so that only existing access roads	–	▪ Low residual effects. Behavioral modifications may occur, but they would be expected to be relatively minor.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

Table C1-20. Mitigation for Wildlife – Bird Species							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
		(micro-site), or apply alternative construction techniques.	would be used in areas where soils and vegetation are particularly sensitive to disturbance.				
▪ Migration disruption or obstruction	▪ See permanent and temporary loss of habitat or habitat fragmentation	–	▪ Agency-Required Mitigation Measure 10 (Limit Accessibility in Sensitive Habitats) would be applied to gate or otherwise block sensitive habitats, in cooperation with the appropriate land management agencies, to limit public access. ▪ Design Feature 2 (Wildlife Disturbance and Harassment) would require that all construction personnel be instructed to avoid harassment and disturbance of wildlife. ▪ Design Feature 3 (Wildlife Vehicle Conflicts) would require that all construction personnel adhere to a 35 mph speed limit to avoid wildlife collisions and disturbance. ▪ The Project design and construction will follow Avian-Safe Design Standards for substations and power lines, which adhere to the Avian Power Line Interaction Committee's Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 and PacifiCorp's Avian Protection Plan(s).	–	▪ Low residual effects would result from minor disturbance in migration routes.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-21. Mitigation for Wildlife – Mammal Species							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
Canada Lynx							
▪ Permanent and temporary loss of habitat or habitat fragmentation	▪ The Project crosses a U.S. Fish and Wildlife Service (USFWS)-mapped Canada lynx Area of Influence.	▪ Design Feature 1 (Preconstruction Surveys for Sensitive Species) would require that field surveys be conducted to determine the presence or absence of sensitive species. ▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route (micro-site), or apply alternative construction techniques.	▪ Ground disturbance would be limited to approved, staked areas. ▪ Whenever possible, grading would be limited to help preserve vegetation and facilitate reclamation success. ▪ Design Feature 6 (Access Road Design) would require that slope cut and fill be minimized to reduce ground disturbance and potential habitat fragmentation.	▪ Agency-Required Mitigation Measure 8 (Interim or Intense Reclamation) would be applied where re-establishment of vegetation has been shown to be difficult, or is expected to be difficult, and intense reclamation would be required (typically) for locations where higher impacts on habitats have been identified (would only be applied to big sagebrush and shrub-steppe vegetation communities in greater sage-grouse priority habitat management areas [PHMA]).	▪ Low residual effects would result from temporary habitat loss and fragmentation.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
▪ Behavioral modifications affecting use of habitat resulting in displacement or disruption of reproduction, foraging, and predation	▪ The Project crosses a USFWS-mapped Canada lynx area of Influence.	▪ Design Feature 1 (Preconstruction Surveys for Sensitive Species) would require that field surveys be conducted to determine the presence or absence of sensitive species. ▪ Agency-Required Mitigation Measure 7 (Seasonal Restrictions) is a condition of the plan of development approval that would be applied to avoid ground-disturbing or disrupting activities associated with construction, operation, and maintenance of the Project during sensitive periods for wildlife and plants. ▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route (micro-site), or apply alternative construction techniques.	▪ Agency-Required Mitigation Measure 10 (Limit Accessibility in Sensitive Habitats) would be applied to gate or otherwise block sensitive habitats in cooperation with the appropriate land management agencies to limit public access. ▪ Design Feature 2 (Wildlife Disturbance and Harassment) would require that all construction personnel be instructed to avoid harassment and disturbance of wildlife. ▪ Design Feature 3 (Wildlife Vehicle Conflicts) would require that all construction personnel adhere to a 35 mph speed limit to avoid wildlife collisions and disturbance.	–	▪ Low residual effects. Behavioral modifications may occur, but they would be expected to be relatively minor.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
Other Special Status Mammal Species							
▪ Permanent and temporary loss of habitat or habitat fragmentation	▪ The Project crosses the following habitat: • 20.1 miles of long-eared myotis habitat • 178.3 miles of pygmy rabbit habitat • 20.7 miles of Townsend's big-eared bat habitat • 212.1 miles of white-tailed prairie dog habitat • 54.9 miles of Wyoming pocket gopher habitat	▪ Design Feature 1 (Preconstruction Surveys for Sensitive Species) would require that field surveys be conducted to determine the presence or absence of sensitive species. ▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route (micro-site), or apply alternative construction techniques.	▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would require that only existing access roads be used in areas where soils and vegetation are particularly sensitive to disturbance.	▪ Agency-Required Mitigation Measure 8 (Interim or Intense Reclamation) would be applied where re-establishment of vegetation has been shown to be difficult, or is expected to be difficult, and intense reclamation would be required (typically) for locations where higher impacts on habitats have been identified (would only be applied to big sagebrush and shrub-steppe vegetation communities in greater sage-grouse PHMA).	▪ Low residual effects would result from temporary habitat loss and fragmentation.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable

Table C1-21. Mitigation for Wildlife – Mammal Species							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
		▪ Year-round spatial restrictions would be implemented.					
▪ Mortality	▪ The Project crosses the following habitat: • 20.1 miles of long-eared myotis habitat • 178.3 miles of pygmy rabbit habitat • 20.7 miles of Townsend's big-eared bat habitat • 212.1 miles of white-tailed prairie dog habitat • 54.9 miles of Wyoming pocket gopher habitat	▪ Design Feature 1 (Preconstruction Surveys for Sensitive Species) would require that field surveys be conducted to determine the presence or absence of sensitive species. ▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route (micro-site), or apply alternative construction techniques. ▪ Year-round spatial restrictions would be implemented.	▪ Design Feature 2 (Wildlife Disturbance and Harassment) would require that all construction personnel be instructed to avoid harassment and disturbance of wildlife. ▪ Design Feature 3 (Wildlife Vehicle Conflicts) would require that all construction personnel adhere to a 35 mph speed limit to avoid wildlife collisions and disturbance. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would require that only existing access roads be used in areas where soils and vegetation are particularly sensitive to disturbance. ▪ Agency-Required Mitigation Measure 10 (Limit Accessibility in Sensitive Habitat) would be applied to gate or otherwise block sensitive habitats, in cooperation with the appropriate land management agencies, to limit public access.	–	▪ Low residual effects. Mortality may occur, but would be expected to be relatively rare and would not limit the long-term sustainability of populations.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be rare and localized and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
▪ Migration disruption or obstruction	▪ The Project crosses the following habitat: • 20.1 miles of long-eared myotis habitat • 20.7 miles of Townsend's big-eared bat habitat	–	▪ Agency-Required Mitigation Measure 10 (Limit Accessibility in Sensitive Habitats) would be applied to gate or otherwise block sensitive habitats, in cooperation with the appropriate land management agencies, to limit public access. ▪ Design Feature 2 (Wildlife Disturbance and Harassment) would require that all construction personnel be instructed to avoid harassment and disturbance of wildlife. ▪ Design Feature 3 (Wildlife Vehicle Conflicts) would require that all construction personnel adhere to a 35 mph speed limit to avoid wildlife collisions and disturbance.	–	▪ Low residual effects would result from minor disturbance in migration routes.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
▪ Behavioral modifications affecting use of habitat resulting in displacement or disruption of reproduction, foraging, and predation	▪ The Project crosses the following habitat: • 20.1 miles of long-eared myotis habitat • 178.3 miles of pygmy rabbit habitat • 20.7 miles of Townsend's big-eared bat habitat • 212.1 miles of white-tailed prairie dog habitat • 54.9 miles of Wyoming pocket gopher habitat	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route (micro-site), or apply alternative construction techniques. ▪ Design Feature 1 (Preconstruction Surveys for Sensitive Species) would	▪ Agency-Required Mitigation Measure 10 (Limit Accessibility in Sensitive Habitats) would be applied to gate or otherwise block sensitive habitats in cooperation with the appropriate land management agencies to limit public access. ▪ Design Feature 2 (Wildlife Disturbance and Harassment) would require that all construction personnel be instructed to avoid	–	▪ Low residual effects. Behavioral modifications may occur, but they would be expected to be relatively minor.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator	▪ Not applicable

Table C1-21. Mitigation for Wildlife – Mammal Species

Impact Indicator[1]	Initial Impacts (Agency Preferred Alternative)[2]	Strategy to Avoid, Minimize, and Rectify Impacts on the Resource			Residual Effects (Agency Preferred Alternative)[3]	Warrant Additional Mitigation?	Mitigation
		Avoidance[4]	Minimize[5]	Rectify/Restore[6]			Additional Mitigation
		require that field surveys be conducted to determine the presence or absence of sensitive species. ▪ Year-round spatial restrictions would be implemented.	harassment and disturbance of wildlife. ▪ Design Feature 3 (Wildlife Vehicle Conflicts) would require that all construction personnel adhere to a 35 mph speed limit to avoid wildlife collisions and disturbance. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would require that only existing access roads be used in areas where soils and vegetation are particularly sensitive to disturbance.			have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

Table C1-22. Mitigation for Wildlife – Big Game

Impact Indicator[1]	Initial Impacts (Agency Preferred Alternative)[2]	Strategy to Avoid, Minimize, and Rectify Impacts on the Resource			Residual Effects (Agency Preferred Alternative)[3]	Warrant Additional Mitigation?	Mitigation
		Avoidance[4]	Minimize[5]	Rectify/Restore[6]			Additional Mitigation
Crucial Winter/Yearlong Ranges for Big Game (Elk Crucial Winter/Yearlong, Antelope Crucial Winter/Yearlong, Mule Deer Crucial Winter, Crucial Winter/Yearlong, and Severe Winter Relief, and Moose Crucial Winter/Yearlong Range)							
▪ Permanent and temporary habitat loss or habitat fragmentation	▪ The Project crosses the following habitat: • 37.2 miles of mule deer crucial winter range • 4.4 miles of mule deer crucial winter/yearlong range • 5.5 miles of mule deer severe winter relief range • 53.8 miles of antelope crucial winter/yearlong range • 31.8 miles of elk crucial winter/yearlong range • 8.2 miles of moose crucial winter/yearlong range	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route (micro-site), or apply alternative construction techniques.	▪ Ground disturbance would be limited to approved, staked areas. ▪ Whenever possible, grading would be limited to help preserve vegetation and facilitate reclamation success. ▪ Design Feature 6 (Access Road Design) would require that slope cut and fill be minimized to reduce ground disturbance and potential habitat fragmentation. ▪ Agency-Required Mitigation Measure 3 (Minimizing or Avoiding Disturbance to Sensitive Soils and Vegetation) would require that only existing access roads be used in areas where soils and vegetation are particularly sensitive to disturbance.	▪ Agency-Required Mitigation Measure 8 (Interim or Intense Reclamation) would be applied where re-establishment of vegetation has been shown to be difficult, or is expected to be difficult, and intense reclamation would be required (typically) for locations where higher impacts on habitats have been identified (would only be applied to big sagebrush and shrub-steppe vegetation communities in greater sage-grouse priority habitat management areas [PHMA]).	▪ Low residual effects would result from temporary habitat loss and fragmentation.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
▪ Behavioral modifications affecting use of crucial winter/yearlong ranges resulting in displacement or disruption of reproduction and foraging	▪ The Project crosses the following habitat: • 37.2 miles of mule deer crucial winter range • 4.4 miles of mule deer crucial winter/yearlong range • 5.5 miles of mule deer severe winter relief range • 53.8 miles of antelope crucial winter/yearlong range • 31.8 miles of elk crucial winter/yearlong range	▪ Design Feature 2 (Wildlife Disturbance and Harassment) would require that all construction personnel be instructed to avoid harassment and disturbance of wildlife. ▪ Agency-Required Mitigation Measure 7 (Seasonal Restrictions) is a condition of plan of development (POD) approval that would be applied to avoid ground-disturbing or disrupting activities associated	▪ Agency-Required Mitigation Measure 10 (Limit Accessibility in Sensitive Habitats) would be applied to gate or otherwise block sensitive habitats, in cooperation with the appropriate land management agencies, to limit public access. ▪ Design Feature 2 (Wildlife Disturbance and Harassment) would require that all construction personnel be instructed to avoid	▪ None	▪ Low residual effects. Behavioral modifications may occur, but they would be expected to be relatively minor.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified	▪ Not applicable

Table C1-22. Mitigation for Wildlife – Big Game							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
	• 8.2 miles of moose crucial winter/yearlong range	with construction, operation, and maintenance of the Project during sensitive periods for wildlife and plants. ▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route (micro-site), or apply alternative construction techniques.	harassment and disturbance of wildlife. ▪ Design Feature 3 (Wildlife Vehicle Conflicts) would require that all construction personnel adhere to a 35 mph speed limit to avoid wildlife collisions and disturbance.			in a mitigation plan as warranting additional appropriate mitigation.	
Migration Routes for Big Game (Elk, Antelope, Deer)							
▪ Migration disruption or obstruction	▪ The Project crosses the following habitat: • 3.9 miles of mule deer migratory route • 9.8 miles of antelope migration route • 2.0 miles of elk migration route	▪ Agency-Required Mitigation Measure 7 (Seasonal Restrictions) is a condition of POD approval that would be applied to avoid ground-disturbing or disrupting activities associated with construction, operation, and maintenance of the Project during sensitive periods for migration routes. ▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route (micro-site), or apply alternative construction techniques.	▪ Agency-Required Mitigation Measure 10 (Limit Accessibility in Sensitive Habitats) would be applied to gate or otherwise block sensitive habitats, in cooperation with the appropriate land management agencies, to limit public access. ▪ Design Feature 2 (Wildlife Disturbance and Harassment) would require that all construction personnel be instructed to avoid harassment and disturbance of wildlife. ▪ Design Feature 3 (Wildlife Vehicle Conflicts) would require that all construction personnel adhere to a 35 mph speed limit to avoid wildlife collisions and disturbance.		▪ Low residual effects would result from minor disturbance in migration routes.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
Parturition Areas (Elk, Mule Deer)							
▪ Permanent and temporary habitat loss or habitat fragmentation	▪ The Project crosses the following habitat: • 1.0 mile of mule deer parturition areas • 1.0 mile of elk parturition areas	▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route (micro-site), or apply alternative construction techniques.	▪ Ground disturbance would be limited to approved, staked areas. ▪ Whenever possible, grading would be limited to help preserve vegetation and to facilitate reclamation success. ▪ Design Feature 6 (Access Road Design) would require that slope cut and fill be minimized to reduce ground disturbance and potential habitat fragmentation. ▪ Agency-Required Mitigation Measure 10 (Limit Accessibility in Sensitive Habitat) would be applied to gate or otherwise block sensitive habitats, in cooperation with the appropriate land management agencies, to limit public access.	▪ Agency-Required Mitigation Measure 8 (Interim or Intense Reclamation) would be applied where re-establishment of vegetation has been shown to be difficult, or is expected to be difficult, and intense reclamation would be required (typically) for locations where higher impacts on habitats have been identified (would only be applied to big sagebrush and shrub-steppe vegetation communities in greater sage-grouse PHMA).	▪ Low residual effects would result from temporary habitat loss and fragmentation.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	▪ Not applicable
▪ Behavioral modifications affecting use of parturition areas resulting in displacement or disruption of reproduction, foraging, and predation	▪ The Project crosses the following habitat: • 1.0 mile of mule deer parturition areas • 1.0 mile of elk parturition areas	▪ Agency-Required Mitigation Measure 7 (Seasonal Restrictions) is a condition of POD approval that would be applied to avoid ground-disturbing or disrupting activities associated with construction, operation, and	▪ Design Feature 2 (Wildlife Disturbance and Harassment) would require that all construction personnel be instructed to avoid harassment and disturbance of wildlife. ▪ Design Feature 3 (Wildlife Vehicle Conflicts) would require that all	▪ None	▪ Low residual effects. Behavioral modifications may occur, but they would be expected to be relatively minor.	▪ No. The nature and extent of residual effects identified through the NEPA process indicate that effects would be minor and temporary and, therefore, do not warrant additional appropriate mitigation. Also, residual effects would not inhibit achieving land-	▪ Not applicable

Table C1-22. Mitigation for Wildlife – Big Game							
Impact Indicator[1]	**Initial Impacts (Agency Preferred Alternative)[2]**	**Strategy to Avoid, Minimize, and Rectify Impacts on the Resource**			**Residual Effects (Agency Preferred Alternative)[3]**	**Warrant Additional Mitigation?**	**Mitigation**
		Avoidance[4]	**Minimize[5]**	**Rectify/Restore[6]**			**Additional Mitigation**
		maintenance of the Project during sensitive periods for parturition areas. ▪ Agency-Required Mitigation Measure 1 (Sensitive Resource Avoidance) would be applied to reduce the width of the right-of-way, adjust the alignment of the pipeline route (micro-site), or apply alternative construction techniques.	construction personnel adhere to a 35 mph speed limit to avoid wildlife collisions and disturbance. ▪ Agency-Required Mitigation Measure 10 (Limit Accessibility in Sensitive Habitat) would be applied to gate or otherwise block sensitive habitats, in cooperation with the appropriate land management agencies, to limit public access.			use plan objectives or compliance with laws, regulations, and/or policies. Finally, residual effects related to this resource indicator have not been previously identified in a mitigation plan as warranting additional appropriate mitigation.	

NOTES:
[1]Impact indicators represent the potential impacts on the resources identified in Chapter 4 (Environmental Consequences) of the RRNP EIS.
[2]Predicted effects of strategies to avoid, minimize, or rectify impacts are not implemented.
[3]When the strategies (including Applicant- committed measures, design features of the Proposed Action for environmental protection, and agency-required mitigation measures in response to identified impacts) described in the columns to the left are applied, they are assumed to be effective at avoiding, minimizing, and rectifying/restoring the identified impact. It is assumed that the mitigation will be effective and applied to the entire resource indicators.
[4]"Avoidance" refers to measures that avoid the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20).
[5]"Minimize" refers to measures that limit the degree or magnitude of the action and its implementation (40 CFR 1508.20).
[6]"Rectify/Restore" refers to measures that would repair, rehabilitate, or restore the affected environment over time (40 CFR 1508.20) (e.g., reclamation practices that would reduce or eliminate impacts during and after the life of the Project).

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix C2 – Compliance with the Governor's Sage Grouse Executive Order 2015-4

WYOMING GAME AND FISH DEPARTMENT

5400 Bishop Blvd. Cheyenne, WY 82006

Phone: (307) 777-4600 Fax: (307) 777-4699

wgfd.wyo.gov

August 31, 2016

WER 50092.00aa
Governor's Sage Grouse Executive Order 2015-4
Density Disturbance Calculation Tool
Denbury Resources, Inc.
Riley Ridge to Natrona Pipeline (Part A)
API #: NA
Sweetwater, Sublette, Fremont, and Natrona Counties

Mr. Rusty Shaw
Denbury Resources, Inc.
5320 Legacy Drive
Plano, TX 75024

Dear Mr. Shaw:

The staff of the Wyoming Game and Fish Department (WGFD) has reviewed the proposed project for compliance with the Governor's Sage Grouse Executive Order 2015-4 (SGEO). **Please note this letter is for sage-grouse recommendations only, and additional wildlife concerns may need to be addressed within the project area.**

It is the responsibility of the state permitting agency(s) to accept or deny the permit based on the following recommendations.

Project Description: DDCT for proposed Riley Ridge to Natrona CO2 pipeline (Part A)

Project Disturbance: 587.84 acres

Time Frame: Indefinite

COT Threat: Infrastructure

Project Location: T25N, R101W, Sections 21, 22, 26
T25N, R102W, Sections 7, 15, 18, 23, 24
T25N, R103W, Sections 5, 6
T26N, R103W, Section 31
T26N, R104W, Section 18, 19, 28, 29, 30, 36

Core Area: Greater South Pass

County: Sweetwater, Sublette, Fremont, and Natrona

Surface/Mineral Ownership: BLM, Private, State

Permitting Agencies: BLM, State

Density/Disturbance Calculation Tool (DDCT): The DDCT process was conducted per Executive Order 2015-4 guidelines using the DDCT web application and reviewed by the WGFD. DDCT results for the project are as follows:

- Project Disturbance = 0.16%
- Total Disturbance = 4.58%
- Density = 0.02/640 acres

Compliance: This project meets both the 5% disturbance and the 1/640 acre density thresholds. This project is compliant with SGEO 2015-4.

This letter replaces the letter submitted April 27, 2015. The Bureau of Land Management was able to produce Plans of Development (POD's) for the Hacienda and Crimson Units (2 of the 3 oil and gas units located in the DDCT area). The POD's for these two units show no foreseeable development and were digitized at the current disturbance on the state wide disturbance layer. A POD was unavailable for the Eden Unit and remained digitized at 100% in the DDCT area. Disturbance in the DDCT area for this section of the Ruby Ridge to Natrona pipeline falls below the 5% threshold set forth in SGEO-2015-4.

Stipulations and Recommendations for Development:
In addition to meeting SGEO disturbance/density guidelines, all stipulations outlined in Attachment B of the SGEO should be required by the permitting agency or agencies, and included in the conditions of the associated permit(s). These include general stipulations on surface disturbance, surface occupancy, seasonal use, geophysical exploration, transportation, overhead power lines, noise, vegetation removal, sagebrush treatment, monitoring/adaptive response, and reclamation, and specific stipulations pertaining to oil and gas, mining, connectivity area, underground rights-of-way, and wind energy development. All projects in core area should be sited and designed to avoid and minimize impacts to sage-grouse and sagebrush habitat.

- All recommendations from the April 2015 letter are still applicable to this project.

Thank you for the opportunity to comment. If you have any questions or concerns, please contact Linda Cope, Staff Terrestrial Biologist, at (307) 777-2533.

Sincerely,

Mary Flanderka
Habitat Protection Supervisor

MF/lc/ns

Enclosures
1) Sage-Grouse Executive Order 2015-4 Worksheet
2) DDCT Final Results

cc: USFWS
Nicholas Graf, WyGISC
Chris Wichmann, Wyoming Department of Agriculture, Cheyenne
Nick Meeker, WDEQ-Air Quality
Craig Smith, WDEQ-Land Quality
Alan Thompson, WDEQ-Solid and Hazardous Waste
Barb Sahl, WDEQ-Water Quality
Susan Child, OSLI
Mark Watson, WOGCC
Joe Scott, WOGCC
Pat Tyrrell, WSEO, Director
Lisa Lindemann, WSEO, Ground Water
Rick Deuell, WSEO, Surface Water

Appendix D – Visual Resources Supporting Data

Appendix D – Visual Resources Supporting Data

D.1 Introduction

Supplementary affected environment information for visual resources potentially affected by the Riley Ridge to Natrona Pipeline Project (Project) is shown below in a tabular format. These data include Bureau of Land Management (BLM) visual resource inventory (VRI) components, scenic quality rating units (SQRU), sensitivity level rating units (SLRU), distance zones, and VRI Classes. This information is valuable to describe the type of scenery and landscapes that may be impacted by the Project at a planning-level, describing the impacts at a regional level versus a project specific assessment, this information has been included in the appendix rather than being included in the Visual Resource portions of Chapters 3 and 4. The information displays a comparison of alternatives, by segment, as it would affect the aforementioned BLM VRI throughout the regional area. Twelve key observation points (KOP) with corresponding contrast rating worksheets are included in Appendix D in addition to visual simulations from three of the KOPs: KOP P-2 Green River Recreational Corridor, KOP RS-1 Red Desert Backcountry Byway, and KOP RS-3 Boars Tusk.

D.2 Segment 1: Riley Ridge Treatment Plant to the Proposed Riley Ridge Sweetening Plant

The miles of the Project in each SQRU class, by field office and alternative route, are described in Table D-1.

Table D-1
Bureau of Land Management Scenic Quality Rating Units in Segment 1

Alternative Route	Area of Project in Scenic Quality Rating Units (miles)		
	Class A	Class B	Class C
Pinedale Field Office			
1A: Proposed Action	2.5	2.4	17.8
1A Variation: Dry Basin Draw	2.5	2.4	18.1
1B: Dry Piney	2.5	10.3	14.1
1C: Figure Four	2.5	7.8	18.6
Rock Springs Field Office			
1A: Proposed Action	0.0	0.0	7.7
1A Variation: Dry Basin Draw	0.0	0.0	7.7
1B: Dry Piney	0.0	0.0	7.7
1C: Figure Four	0.0	0.0	9.5

The miles of the Project in each SLRU level, by field office and alternative, are described in Table D-2.

Table D-2
Bureau of Land Management Sensitivity Level Rating Units in Segment 1

Alternative Route	Area of Project in Sensitivity Level Rating Units (miles)		
	High Sensitivity	Moderate Sensitivity	Low Sensitivity
Pinedale Field Office			
1A: Proposed Action	2.5	2.4	17.8
1A Variation: Dry Basin Draw	2.5	2.4	18.1
1B: Dry Piney	2.5	10.8	14.1
1C: Figure Four	2.5	7.8	18.6
Rock Springs Field Office			
1A: Proposed Action	0.0	0.0	7.7
1A Variation: Dry Basin Draw	0.0	0.0	7.7
1B: Dry Piney	0.0	0.0	7.7
1C: Figure Four	0.0	0.0	9.5

The miles of the Project in each distance zone, by field office and alternative, are described in Table D-3.

Table D-3
Bureau of Land Management Visual Distance Zones in Segment 1

Alternative Route	Area of Project in Visual Distance Zones (miles)			
	Foreground-Middleground	Background	Seldom Seen	Not Identifiable
Pinedale Field Office				
1A: Proposed Action	0.0	0.0	0.0	22.6
1A Variation: Dry Basin Draw	0.0	0.0	0.0	22.9
1B: Dry Piney	0.0	0.0	0.0	26.8
1C: Figure Four	0.0	0.0	0.0	28.9
Rock Springs Field Office				
1A: Proposed Action	7.7	0.0	0.0	0.0
1A Variation: Dry Basin Draw	7.7	0.0	0.0	0.0
1B: Dry Piney	7.7	0.0	0.0	0.0
1C: Figure Four	9.5	0.0	0.0	0.0

The miles of the Project in each VRI Class, by field office and alternative, are described in Table D-4.

Table D-4
Bureau of Land Management
Visual Resource Inventory Classes in Segment 1

Alternative Route	Area of Project in Visual Resource Inventory Classes (miles)			
	Class II	Class III	Class IV	Not Identifiable
Pinedale Field Office				
1A: Proposed Action	0.0	0.0	0.0	22.8
1A Variation: Dry Basin Draw	0.0	0.0	0.0	22.9
1B: Dry Piney	0.0	0.0	0.0	26.8
1C: Figure Four	0.0	0.0	0.0	28.9
Rock Springs Field Office				
1A: Proposed Action	0.0	0.0	7.7	0.0
1A Variation: Dry Basin Draw	0.0	0.0	7.7	0.0
1B: Dry Piney	0.0	0.0	7.7	0.0
1C: Figure Four	0.0	0.0	9.5	0.0

D.3 Segment 2: Proposed Riley Ridge Sweetening Plant to the Bairoil Interconnect

The miles of the Project in each SQRU class, by field office and alternative, are described in Table D-5.

Table D-5
Bureau of Land Management Scenic Quality Rating Units in Segment 2

Alternative Route	Area of Project in Scenic Quality Rating Units (miles)		
	Class A	Class B	Class C
Lander Field Office			
2A: Proposed Action	0.0	15.8	4.8
2B: Southern Route	0.0	15.8	4.8
Rawlins Field Office			
2A: Proposed Action	0.0	0.0	11.7
2B: Southern Route	0.0	0.0	11.7
Rock Springs Field Office			
2A: Proposed Action	0.0	24.2	75.5
2B: Southern Route	0.0	15.2	88.6

The miles of the Project in each SLRU level, by field office and alternative, are described in Table D-6.

Table D-6
Bureau of Land Management Sensitivity Level Rating Units in Segment 2

Alternative Route	Area of Project in Sensitivity Level Rating Units (miles)		
	High Sensitivity	Moderate Sensitivity	Low Sensitivity
Lander Field Office			
2A: Proposed Action	8.8	11.9	0.0
2B: Southern Route	8.8	11.9	0.0
Rawlins Field Office			
2A: Proposed Action	0.0	11.8	0.0
2B: Southern Route	0.0	11.8	0.0
Rock Springs Field Office			
2A: Proposed Action	63.4	33.3	0.0
2B: Southern Route	64.8	39.0	0.0

The miles of the Project in each distance zone, by field office and alternative, are described in Table D-7.

Table D-7
Bureau of Land Management Visual Distance Zones in Segment 2

Alternative Route	Area of Project in Visual Distance Zones (miles)			
	Foreground-Middleground	Background	Seldom Seen	Not identifiable
Lander Field Office				
2A: Proposed Action	20.7	0.0	0.0	0.0
2B: Southern Route	20.7	0.0	0.0	0.0
Rawlins Field Office				
2A: Proposed Action	11.8	0.0	0.0	0.0
2B: Southern Route	11.8	0.0	0.0	0.0
Rock Springs Field Office				
2A: Proposed Action	96.7	0.0	0.0	0.0
2B: Southern Route	103.8	0.0	0.0	0.0

The miles of the Project in each VRI Class, by field office and alternative, are described in Table D-8.

Table D-8
Bureau of Land Management Visual Resource Inventory Classes in Segment 2

Alternative Route	Area of Project in Visual Resource Inventory Classes (miles)			
	Class II	Class III	Class IV	Not Identifiable
Lander Field Office				
2A: Proposed Action	4.0	16.7	0.0	0.0
2B: Southern Route	4.0	16.7	0.0	0.0
Rawlins Field Office				
2A: Proposed Action	0.0	0.0	11.8	0.0
2B: Southern Route	0.0	0.0	11.8	0.0
Rock Springs Field Office				
2A: Proposed Action	52.1	11.5	33.2	0.0
2B: Southern Route	42.4	33.3	28.1	0.0

D.4 Segment 3: Bairoil Interconnect to the Lost Cabin/Natrona Hub Interconnect

The miles of the Project in each SQRU class, by field office and alternative, are described in Table D-9.

Table D-9
Bureau of Land Management Scenic Quality Rating Units in Segment 3

Alternative Route	Area of Project in Scenic Quality Rating Units (miles)		
	Class A	Class B	Class C
Casper Field Office			
3A: Proposed Action	0.0	11.2	24.9
3B: Lost Creek to Lost Cabin	0.0	0.0	0.0
3C: Lost Creek to Highway 20/26	0.0	0.0	30.1
Lander Field Office			
3A: Proposed Action	0.0	13.3	59.7
3B: Lost Creek to Lost Cabin	0.0	13.3	59.7
3C: Lost Creek to Highway 20/26	0.0	13.3	58.1

The miles of the Project in each SLRU level, by field office and alternative, are described in Table D-10.

Table D-10
Bureau of Land Management Sensitivity Level Rating Units in Segment 3

Alternative Route	Area of Project in Sensitivity Level Rating Units (miles)		
	High Sensitivity	Moderate Sensitivity	Low Sensitivity
Casper Field Office			
3A: Proposed Action	9.7	24.2	2.2
3B: Lost Creek to Lost Cabin	0.0	0.0	0.0
3C: Lost Creek to Highway 20/26	10.0	14.8	5.3
Lander Field Office			
3A: Proposed Action	19.9	6.8	20.4
3B: Lost Creek to Lost Cabin	19.9	6.8	46.3
3C: Lost Creek to Highway 20/26	19.9	6.8	44.6

The miles of the Project in each distance zone, by field office and alternative, are described in Table D-11.

Table D-11
Bureau of Land Management Visual Distance Zones in Segment 3

Alternative Route	Area of Project in Visual Distance Zones (miles)			
	Foreground-Middleground	Background	Seldom Seen	Not Identifiable
Casper Field Office				
3A: Proposed Action	1589	20.1	0.0	0.0
3B: Lost Creek to Lost Cabin	0.0	0.0	0.0	0.0
3C: Lost Creek to Highway 20/26	26.8	3.2	0.0	0.0
Lander Field Office				
3A: Proposed Action	43.7	2.4	1.7	0.0
3B: Lost Creek to Lost Cabin	68.6	3.3	1.1	0.0
3C: Lost Creek to Highway 20/26	67.0	3.3	1.1	0.0

The miles of the Project in each VRI Class, by field office and alternative, are described in Table D-12.

Table D-12
Bureau of Land Management Visual Resource Inventory Classes in Segment 3

Alternative Route	Area of Project in Visual Resource Inventory Classes (miles)			
	Class II	Class III	Class IV	Not Identifiable
Casper Field Office				
3A: Proposed Action	0.0	14.9	21.2	0.0
3B: Lost Creek to Lost Cabin	0.0	0.0	0.0	0.0
3C: Lost Creek to Highway 20/26	0.0	10.0	20.0	0.0
Lander Field Office				
3A: Proposed Action	6.75	19.1	21.4	0.0
3B: Lost Creek to Lost Cabin	6.75	19.1	47.2	0.0
3C: Lost Creek to Highway 20/26	6.75	19.1	45.6	0.0

THIS PAGE INTENTIONALLY LEFT BLANK

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Pinedale
Resource Area:
Activity (program): Pipeline Project

Project Name: Riley Ridge to Natrona Project	**Location:**	**Location Sketch**
Key Observation Point: P1: North Piney Creek to Smith's Fork High Potential Route Segment	Township: 29N Range: 113W	
VRM Class: Visual Resource Management (VRM) Class II	Section: 5	

Characteristic Landscape Description

	Landform/Water	Vegetation	Structures
Form	Flat to gradual slopes	Low mounds to smooth	FG: Low vertical geometric repeating BG: Tall vertical repeating
Line	Horizontal diagonal subtle irregular	Soft continuous	Vertical, horizontal
Color	Brown, dull pastel orange, tan	Sagebrush green, olive green, light green, yellow	Black, brown, tan
Texture	Fine grain	Medium to fine grain	Fine grain

Proposed Activity Description (Facility)

	Landform/Water	Vegetation	Structures
Form	Level horizontal	Horizontal, linear clearing	Not applicable
Line	Horizontal	Strong curvilinear line parallel to existing road	Not applicable
Color	Tan, beige, brown	Light green, tan	Not applicable
Texture	Fine grain	Fine grain	Not applicable

Distance Zones – FG = Foreground, MG = Middleground, BG = Background

Degree of Contrast

		Features											
		Landform/ Water Body				Vegetation				Structures			
Degree of Contrast		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form												
	Line												
	Color												
	Texture												

Does project design meet visual resource management objectives?
Yes

Additional mitigating measures recommended?
No

Evaluator Name(s):
EPG Visual Personnel

VISUAL CONTRAST RATING WORKSHEET

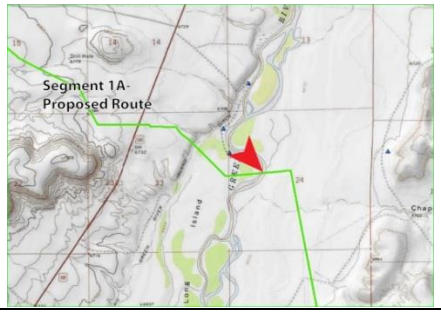
Date: 8/14/2015
District/Field Office: Pinedale
Resource Area:
Activity (program): Pipeline Project

Photo taken toward the southwest from Piney Fish Creek Road

Weak contrast would result from the construction and operation of the Project in this Bureau of Land Management (BLM) VRM Class II partially contained landscape. Due to the terrain provided the Project would become visible at approximately 2.5 miles away and would be minimally visible for a short period and the recede behind the topography.

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Pinedale
Resource Area:
Activity (program): Pipeline Project

Project Name: Riley Ridge to Natrona Project **Key Observation Point:** P2: Green River Recreational Corridor **VRM Class:** VRM Class II	**Location:** Township: 28N Range: 112W Section: 23	**Location Sketch** 

Characteristic Landscape Description

	Landform/Water	Vegetation	Structures
Form	Flat, valley plains, angular	Band along riparian corridor, indistinct shapes, groupings of mounds	Not applicable
Line	Horizontal, diagonal, meandering (river)	Digitate edge, curvilinear butt edge, diagonal edge	Not applicable
Color	Tan with a soft hue of orange	dark green, sage green, light green, specs of yellow	Not applicable
Texture	Fine to medium grain (stones) Smooth (river)	Fine to coarse grain, sparse density with groups of dense areas	Not applicable

Proposed Activity Description (Facility)

	Landform/Water	Vegetation	Structures
Form	Horizontal, level linear shapes	Low linear clearings	Low vertical thin geometric shapes perpendicular crossings of river (pipeline markers)
Line	Horizontal, geometric	Horizontal, butt edge along right-of-way and access roads	Not applicable
Color	Tan with a soft hue of orange	Light green (revegetation)	Not applicable
Texture	Fine grain	Fine grain	Not applicable

Distance Zones – FG = Foreground, MG = Middleground, BG = Background

Degree of Contrast

		Features											
		Landform/ Water Body				Vegetation				Structures			
Degree of Contrast		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form		■			■						■	
	Line		■			■							■
	Color		■					■					■
	Texture			■		■							■

Does project design meet visual resource management objectives?
No

Additional mitigating measures recommended?
Yes

Evaluator Name(s):
EPG Visual Personnel

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Pinedale
Resource Area:
Activity (program): Pipeline Project

Photo taken toward the southeast from the Green River

Moderate to strong contrast would result from construction and operation of the Project in this BLM VRM Class II partially contained landscape. Due to the scenic value and recreational opportunities provided by the Green River, clearing of vegetation (i.e., cottonwoods) would be quickly discerned when looking at this landscape. The right-of-way would be visible directly adjacent to this viewpoint and at the crossing of the river (as well as views from the additional contextual photo locations). Through the application of Selective Mitigation Measures 1, 3, 5, 6, 8, and 9, the Project would meet BLM VRM Class II objectives in particular horizontal drilling under the river and adjacent riparian vegetation to reduce the removal of the vegetation characteristic of this landscape.

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Pinedale
Resource Area:
Activity (program): Pipeline Project

Additional context photograph from 42.396°, -110.113° toward the northwest

Moderate contrast would result from the introduction of the Pipeline Project to this BLM VRM Class II landscape through a partially contained landscape although this view is not easily accessed by the majority of the users of the Green River. The clearing of vegetation would be noticed and the change in vegetation color created by the clearing of the right-of way would be seen. This view would be affected by all alternatives in Segment 1 but 1C - Figure 4.

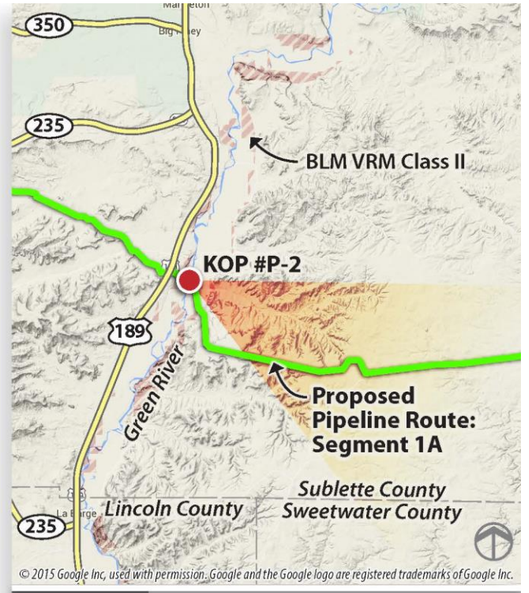
VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Pinedale
Resource Area:
Activity (program): Pipeline Project

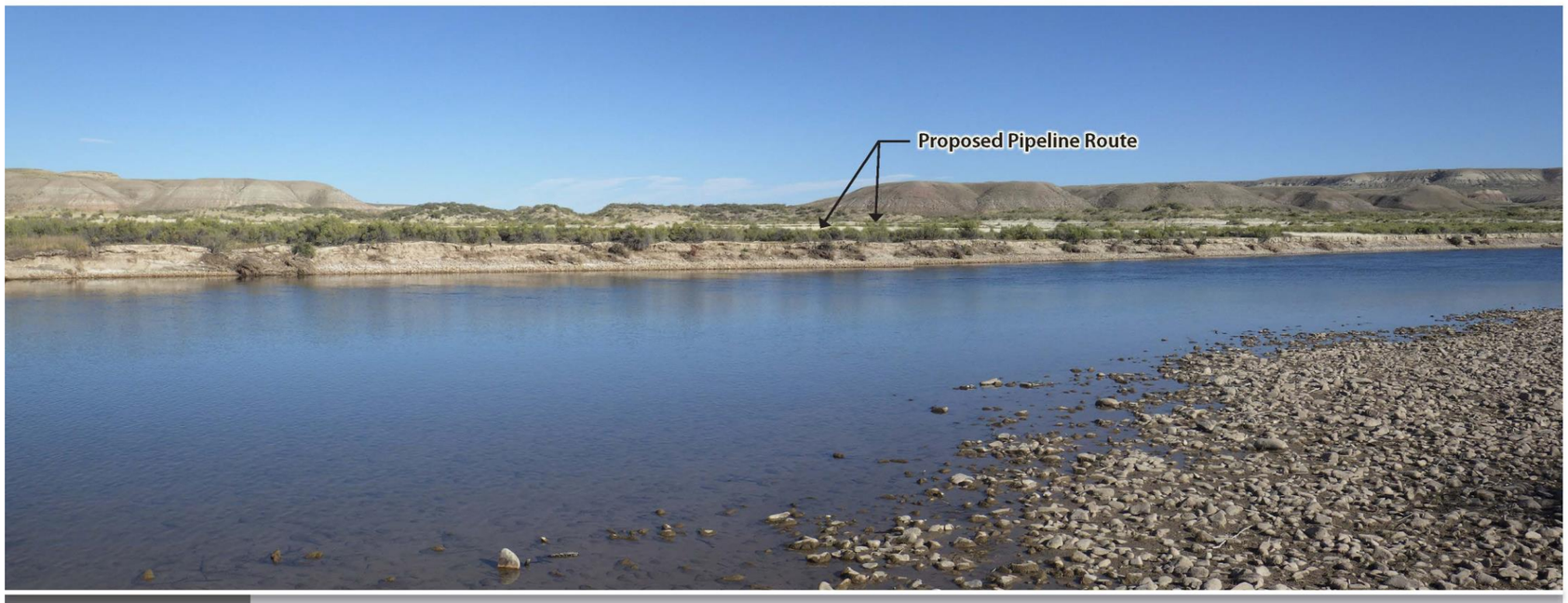
Additional context photograph from 42.398°, -110.116° toward the southeast

Moderate contrast would result from the introduction of the Pipeline Project to this BLM VRM Class II landscape through a partially contained landscape although this view is not accessed by the majority of the users of the Green River. The slightly superior view would and increase the visibility of the right-of-way, as well as the clearing of the riparian vegetation, created by the by all alternatives in Segment 1 but 1C- Figure 4.

Existing Condition View looking southeast from recreation use areas along the Green River toward BLM VRM Class II lands



Viewing Location Viewpoint located approximately 0.2 mile from proposed pipeline route

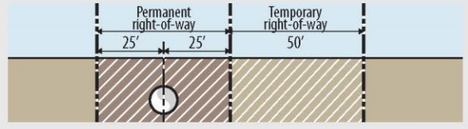


Simulated Condition View of Segment 1A – Proposed Action, Segment 1B – Dry Piney, and Segment 1C – Figure 4

Photo Date and Time: September 15, 2015, 5:16 p.m.

Focal Length: 50mm (The original photographs were taken at 50mm, then stitched together to create this panorama, resulting in an approximately 65-degree field of view)

Right-of-Way Section:



This simulation and right-of-way section are for illustrative purposes only. The project depicted in the simulation reflects preliminary route information. Final pipeline route and right-of-way section will differ based on final engineering and design.

Riley Ridge to Natrona Pipeline Project

KOP #P-2: Green River Recreational Corridor

DRAFT **November 2015**

THIS PAGE INTENTIONALLY LEFT BLANK

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Rock Springs
Resource Area:
Activity (program): Pipeline Project

Project Name: Riley Ridge to Natrona Project	**Location:**	**Location Sketch**
Key Observation Point: RS-1: Red Desert Backcountry Byway	Township: 25N	
VRM Class: VRM Class II	Range: 102W	
	Section: 15	

Characteristic Landscape Description

	Landform/Water	Vegetation	Structures
Form	Rolling smooth gradual slopes	Low amorphous stippled	Low vertical thin geometric
Line	Curving smooth	Band divided by smooth line of road	Vertical
Color	Tan, beige, brown	Sagebrush green, olive green, light green	Dark brown, white
Texture	Fine grain	Medium, dense even to gradation regularity (moving up the rolling hills)	Fine grain

Proposed Activity Description (Facility)

	Landform/Water	Vegetation	Structures
Form	No change to landform	Curvilinear clearing	Low vertical thin geometric at road crossing (pipeline markers)
Line	Strong curvilinear line parallel to existing road	Strong curvilinear line parallel to existing road	Not applicable
Color	Tan, beige, brown	Light green, tan	Not applicable
Texture	Fine grain	Fine grain	Not applicable

Distance Zones – FG = Foreground, MG = Middleground, BG = Background

Degree of Contrast

		Features											
		Landform/ Water Body				Vegetation				Structures			
Degree of Contrast		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form			■		■						■	
	Line	■				■							■
	Color	■				■							■
	Texture			■				■					■

Does project design meet visual resource management objectives?
No

Additional mitigating measures recommended?
Yes

Evaluator Name(s):
EPG Visual Personnel

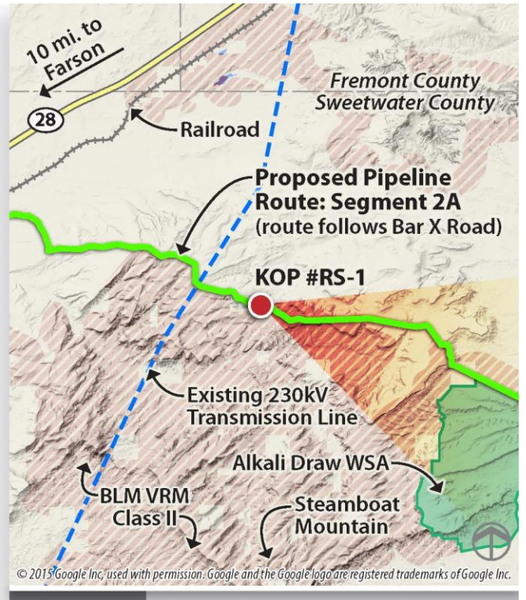
VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Rock Springs
Resource Area:
Activity (program): Pipeline Project

Photo taken toward the northwest from a highpoint along Red Desert Scenic Backcountry Byway

Moderate to strong contrast would result from the construction of the Project due to the regularity and low growing form of the vegetation as well as the prominence of the linear form of the Project. This results from the long duration and superior views of the Project receding out into the view in a smooth textured landscape. With all these factors increasing the duration of visibility and taking into consideration the alignment of the linear project paralleling the Red Desert Scenic Backcountry Byway, the Project would not be compliant with BLM VRM Class II objectives. Through application of Selective Mitigation Measures 1, 2, 3, 4, 5, 8, and 9, the Project would meet BLM VRM Class II objectives.

Existing Condition View looking southeast along the Red Desert Backcountry Byway adjacent to the Alkali Draw WSA toward BLM VRM Class II lands



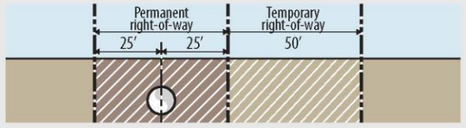
Viewing Location Viewpoint located approximately 0.1 mile from and parallel to proposed pipeline route

Simulated Condition View of Segment 2A – Proposed Action

Photo Date and Time: July, 21 2015, 11:23 a.m.

Focal Length: 50mm

Right-of-Way Section:



This simulation and right-of-way section are for illustrative purposes only. The project depicted in the simulation reflects preliminary route information. Final pipeline route and right-of-way section will differ based on final engineering and design.

Riley Ridge to Natrona Pipeline Project

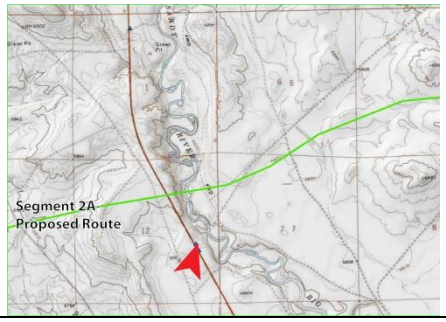
KOP #RS-1: Red Desert Backcountry Byway

DRAFT **November 2015**

THIS PAGE INTENTIONALLY LEFT BLANK

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Rock Springs
Resource Area:
Activity (program): Pipeline Project

Project Name: Riley Ridge to Natrona Project	**Location:**	**Location Sketch**
Key Observation Point: RS-2: Highway 191 (North)	Township: 27N	
VRM Class: VRM Class III	Range: 107W	
	Section: 12	

Characteristic Landscape Description

	Landform/Water	Vegetation	Structures
Form	Low rolling hills, plains, meandering river	Low, irregular, stippled towards slopes	Low vertical mile marker
Line	Continuous horizontal diagonal, meandering	Diffused, stippled, butted	Straight vertical, linear
Color	Tan, grey, brown	Yellow, orange, sagebrush green, olive green, tan	Dark brown
Texture	Fine grain	Medium to fine grain	Uniform coarse grain

Proposed Activity Description (Facility)

	Landform/Water	Vegetation	Structures
Form	Low rolling level	Horizontal, linear clearing	Low vertical thin geometric at road crossing (pipeline markers)
Line	Horizontal diagonal	Horizontal diagonal	Not applicable
Color	Tan brown	Light brown	Not applicable
Texture	Fine grain	Fine grain	Not applicable

Distance Zones – FG = Foreground, MG = Middleground, BG = Background

Degree of Contrast

		Features											
		Landform/ Water Body				Vegetation				Structures			
Degree of Contrast		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form			■				■				■	
	Line		■				■						■
	Color			■				■					■
	Texture		■				■						■

Does project design meet visual resource management objectives?
Yes

Additional mitigating measures recommended?
Yes

Evaluator Name(s):
EPG Visual Personnel

VISUAL CONTRAST RATING WORKSHEET

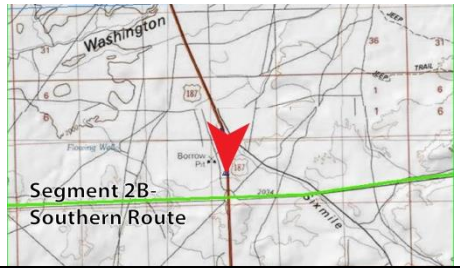
Date: 8/14/2015
District/Field Office: Rock Springs
Resource Area:
Activity (program): Pipeline Project

Photo taken toward the northeast at turnoff of U.S. Highway 191 facing Proposed Route

Moderate contrast would result from the construction and operation of the proposed Project within this BLM VRM Class III landscape. The Project would be visible as a diagonal line in the landscape affecting a designated view of Wyoming's Wildlife established by the State of Wyoming for visitors of Wyoming's section of U.S. Highway 191. Through application of Selective Mitigation Measures 3 and 5, contrast introduced by the Project would be reduced.

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Pinedale
Resource Area:
Activity (program): Pipeline Project

Project Name: Riley Ridge to Natrona Project	**Location:**	**Location Sketch**
Key Observation Point: RS-2: Highway 191 (South)	Township: 23N	
VRM Class: VRM Class III	Range: 106W	
	Section: 10	

Characteristic Landscape Description

	Landform/Water	Vegetation	Structures
Form	Low rolling plains	Low, flat, regular, sparse clumped mounds	Low vertical geometric
Line	Regular, straight	Band created by National Historic Trail (NHT) over horizontal	Straight vertical, linear
Color	Tan, beige, brown	Sagebrush green, olive green	Dark brown
Texture	Fine grain	Fine with patches of medium grain	Uniform coarse grain

Proposed Activity Description (Facility)

	Landform/Water	Vegetation	Structures
Form	Not applicable	Horizontal, linear clearing	Low vertical thin geometric at road crossing (pipeline markers)
Line	Straight along ridge	Band of lighter vegetation	Not applicable
Color	Tan brown	Light brown	Not applicable
Texture	Fine grain	Fine grain	Not applicable

Distance Zones – FG = Foreground, MG = Middleground, BG = Background

Degree of Contrast

		Features											
		Landform/ Water Body				Vegetation				Structures			
Degree of Contrast		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form			■				■				■	
	Line			■				■					■
	Color			■			■						■
	Texture			■				■					■

Does project design meet visual resource management objectives?
Yes

Additional mitigating measures recommended?
Yes

Evaluator Name(s):
EPG Visual Personnel

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Pinedale
Resource Area:
Activity (program): Pipeline Project

Photo taken toward the south on U.S. Highway 191 facing Southern Route Alternative

Weak contrast would result from the construction and operation of the proposed Project crossing the U.S. Highway 191. The Project would cross the road at a perpendicular angle and continue outwards along the highpoint of the ridge. Due to the low horizontal nature of the right-of-way clearing proposed, the Project would be minimally visible in this BLM VRM Class III landscape. The small vertical indicator markers will be visible to the extent needed in accordance with 49 CFR 195.410 where the Project intersects the road. Through application of Selective Mitigation Measures 3 and 5, contrast introduced by the Project would be reduced.

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Rock Springs
Resource Area:
Activity (program): Pipeline Project

Project Name: Riley Ridge to Natrona Project	**Location:**	**Location Sketch**
Key Observation Point: RS-3: Boars Tusk	Township: 23N	
VRM Class: VRM Class II	Range: 104W	
	Section: 16	

Characteristic Landscape Description

	Landform/Water	Vegetation	Structures
Form	Flat plains with sparse rough rocks	FG: Mound regular stippled MG: Stippled, simple patterns created by color change of vegetation	None
Line	Horizontal, continuous, soft	Flowing broken lines formed by color change of vegetation	None
Color	Brown , tan, orange	Sagebrush green, olive green, light green	None
Texture	Medium grain	Medium grain, regular	None

Proposed Activity Description (Facility)

	Landform/Water	Vegetation	Structures
Form	No change to landform	Horizontal, linear clearing	Low vertical thin geometric at road crossing (pipeline markers)
Line	Strong horizontal band	Strong horizontal band	Not applicable
Color	Tan, beige, brown	Tan, beige, brown	Not applicable
Texture	Fine grain	Fine grain band	Not applicable

Distance Zones – FG = Foreground, MG = Middleground, BG = Background

Degree of Contrast

		Features											
		Landform/ Water Body				Vegetation				Structures			
Degree of Contrast		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form			■			■					■	
	Line		■			■							■
	Color		■			■							■
	Texture		■			■							■

Does project design meet visual resource management objectives?
No

Additional mitigating measures recommended?
Yes

Evaluator Name(s):
EPG Visual Personnel

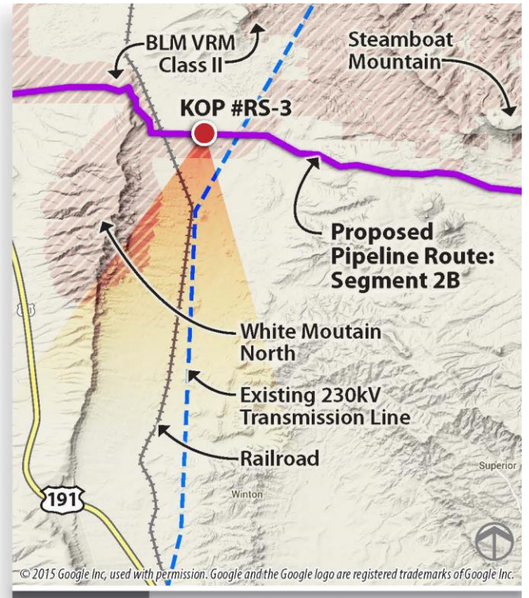
VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Rock Springs
Resource Area:
Activity (program): Pipeline Project

Photo taken toward the south on Boars Tusk facing Southern Route Alternative

Moderate to strong contrast would result from the construction and operation of the Project. This location is a recreational landmark that holds tribal significance along with having a status of BLM VRM Class II. The landscape has a consistent mottled texture vegetation with simple changes in color throughout the surrounding panoramic landscape. The vegetation consists of slow and low growing sagebrush and desert scrub vegetation. With the vantage point provided by Boars Tusk, the Project right-of-way will be prominent in the landscape for the length of the viewing distance. Through the application of Selective Mitigation Measures 1, 3, 5, 8, and 9, the Project would meet BLM VRM Class II objectives.

Existing Condition View looking southeast from Boars Tusk recreation site toward BLM VRM Class II lands



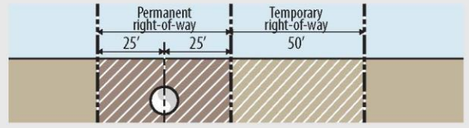
Viewing Location Viewpoint located approximately 0.5 mile from proposed pipeline route

Simulated Condition View of Segment 2B – Southern Route

Photo Date and Time: July, 21 2015, 8:41 a.m.

Focal Length: 50mm

Right-of-Way Section:



This simulation and right-of-way section are for illustrative purposes only. The project depicted in the simulation reflects preliminary route information. Final pipeline route and right-of-way section will differ based on final engineering and design.

Riley Ridge to Natrona Pipeline Project

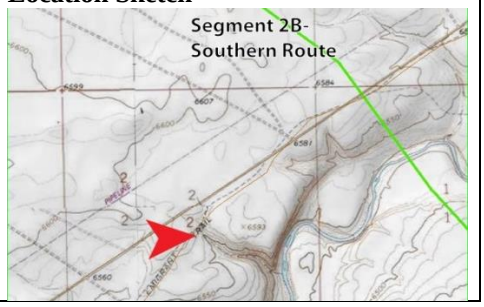
KOP #RS-3: Boars Tusk

DRAFT **November 2015**

THIS PAGE INTENTIONALLY LEFT BLANK

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Rock Springs
Resource Area:
Activity (program): Pipeline Project

Project Name: Riley Ridge to Natrona Project **Key Observation Point:** RS-4: NHT Auto Tour Route (Highway 28) **VRM Class:** VRM Class IV	**Location:** Township: 23N Range: 108W Section: 2	**Location Sketch** 

Characteristic Landscape Description

	Landform/Water	Vegetation	Structures
Form	Rolling smooth gradual slopes	FG: Low mounds, low sparsely grouped thin vertical grouping BG: Stippled Regular	Short geometric cubical shapes Short thin vertical rectangular prism
Line	Curvilinear smooth (roundabout) horizontal, smooth, continuous	Band divided by smooth line of road	Vertical curvilinear
Color	Tan, orange, brown	Sagebrush green, olive green, light green	Brown, tan, beige, white
Texture	FG: Medium grain BG: Fine grain	Medium, dense even to gradation regularity (moving up the rolling hills)	Smooth (top surface of signage and trail obelisk) rough (rock surface of stand for signage)

Proposed Activity Description (Facility)

	Landform/Water	Vegetation	Structures
Form	Rolling smooth gradual slopes	Horizontal, linear clearing	Not applicable
Line	Horizontal, gentle, rolling	Horizontal band following existing topography	Not applicable
Color	Tan, orange, brown	Tan, orange, brown	Not applicable
Texture	Fine grain	Fine grain	Not applicable

Distance Zones – FG = Foreground, MG = Middleground, BG = Background

Degree of Contrast

Degree of Contrast		Features: Landform/Water Body				Features: Vegetation				Features: Structures			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form			■			■						■
	Line		■				■						■
	Color		■				■						■
	Texture		■					■					■

Does project design meet visual resource management objectives?
Yes

Additional mitigating measures recommended?
Yes

Evaluator Name(s):
EPG Visual Personnel

VISUAL CONTRAST RATING WORKSHEET

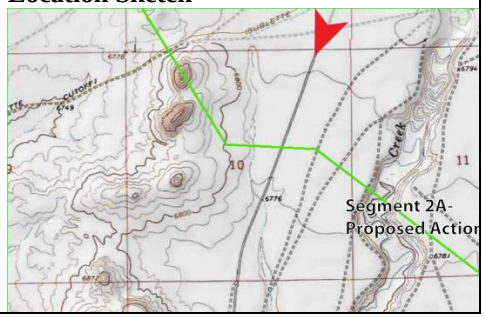
Date: 8/14/2015
District/Field Office: Rock Springs
Resource Area:
Activity (program): Pipeline Project

Photo taken toward the northeast off of Highway 28 NHT Auto Tour Route Pullout, facing Southern Route Alternative

Moderate contrast would result from the construction and operation of the Project in BLM VRM Class IV lands. Although the Project would be intermittent visible along State Highway 28, due to the smooth rolling hills, where visible, the horizontal band created by the right-of-way would modify the view that has been set as a historic setting. Through the application of Selective Mitigation Measures 5, 8, and 9, contrast introduced by the Project would be reduced.

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Rock Springs
Resource Area:
Activity (program): Pipeline Project

Project Name: Riley Ridge to Natrona Project	**Location:**	**Location Sketch**
Key Observation Point: RS-5: NHT Sublette Cutoff Trail Trace (Proposed Action)	Township: 26N Range: 105W Section: 3	
VRM Class: VRM Class IV		

Characteristic Landscape Description

	Landform/Water	Vegetation	Structures
Form	Flat horizontal plains, gently rolling with sparse irregular vertical rock formation found at the boundary of the landscape	FG: mound stippled random MG/BG: Low, flat, uniform	Low vertical rectangular prism
Line	Regular, straight	Double band created by NHT trail trace curving off into the distance	Low vertical rectangular prism
Color	Tan, beige, brown	Sagebrush green, olive green	Brown
Texture	Fine grain	Dense, medium to fine	Fine wood grain

Proposed Activity Description (Facility)

	Landform/Water	Vegetation	Structures
Form	Flat, horizontal	Low, flat linear clearing	Low vertical thin geometric at road and trail crossing (pipeline markers)
Line	Horizontal band	Horizontal, linear clearing	Not applicable
Color	Tan, beige	Tan, beige,	Not applicable
Texture	Fine grain	Fine grain	Not applicable

Distance Zones – FG = Foreground, MG = Middleground, BG = Background

Degree of Contrast

Degree of Contrast		Features											
		Landform/ Water Body				Vegetation				Structures			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form			■			■					■	
	Line			■			■						■
	Color		■				■						■
	Texture		■				■						■

Does project design meet visual resource management objectives?
Yes

Additional mitigating measures recommended?
Yes

Evaluator Name(s):
EPG Visual Personnel

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Rock Springs
Resource Area:
Activity (program): Pipeline Project

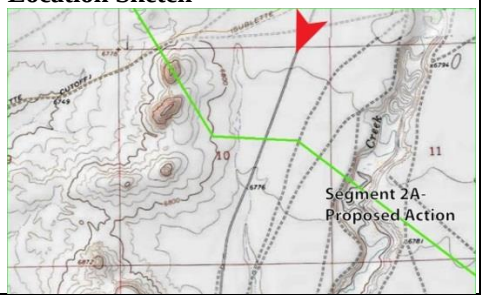
Photo taken toward the South on NHT Sublette Cutoff of the California NHT facing Proposed Action

Moderate contrast would result from the construction and operation of the proposed Project within the panoramic BLM VRM Class IV landscape. The Project would intersect the Sublette of the California NHT at a perpendicular angle. Given the viewing angle at this location and the width of the right-of-way, the project would be a low visible horizontal line in the landscape. Through the application of Selective Mitigation Measures 2, 4, 5, 8, and 9, contrast introduced by the Project would be reduced.

The Sublette Cutoff of the California NHT appears to be intact. With only a small county road, that is marginally visible from the trail, and dispersed trail markers along the trail, the area appears as it would during the time period of significance.

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Rock Springs
Resource Area:
Activity (program): Pipeline Project

Project Name: Riley Ridge to Natrona Project	**Location:**	**Location Sketch**
Key Observation Point: RS-5: NHT Sublette Cutoff Trail Trace (Under Feasibility Study) Southern Route	Township: 26N Range: 110W Section: 2	
VRM Class: VRM Class IV		

Characteristic Landscape Description

	Landform/Water	Vegetation	Structures
Form	Flat horizontal plains	Regular low mound	Not applicable
Line	Regular, straight	Band created by NHT trail trace	Not applicable
Color	Brown	Sagebrush green, olive green, patches of yellow	Not applicable
Texture	Fine grain	Dense, medium to fine	Not applicable

Proposed Activity Description (Facility)

	Landform/Water	Vegetation	Structures
Form	Flat, horizontal	Low, flat linear clearing	Low vertical thin geometric at road and trail crossing (pipeline markers)
Line	Horizontal band	Horizontal, linear clearing	Not applicable
Color	Brown	Brown	Not applicable
Texture	Fine grain	Fine grain	Not applicable

Distance Zones – FG = Foreground, MG = Middleground, BG = Background

Degree of Contrast

		Features											
		Landform/ Water Body				Vegetation				Structures			
Degree of Contrast		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form			■			■					■	
	Line			■			■						■
	Color		■				■						■
	Texture			■			■						■

Does project design meet visual resource management objectives?
Yes

Additional mitigating measures recommended?
Yes

Evaluator Name(s):
EPG Visual Personnel

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Rock Springs
Resource Area:
Activity (program): Pipeline Project

Photo taken toward the west on NHT Sublette Cutoff of the California NHT facing Southern Route

Moderate contrast would result from the construction and operation of the proposed Project within the panoramic BLM VRM Class IV landscape. The Project would intersect the Sublette Cutoff of the California NHT at a perpendicular angle in an intact landscape setting. Given the viewing angle at this location and the width of the right-of-way, the Project would be intermittently visible in the landscape after construction. Through the application of Selective Mitigation Measures 5, 8, and 9, contrast introduced by the Project would be reduced.

Without any visible cultural modifications in the area, the setting of the Sublette Cutoff of the California NHT appears to be intact and has maintained its setting as it would have appeared during the period it was historically used.

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Rock Springs
Resource Area:
Activity (program): Pipeline Project

Project Name: Riley Ridge to Natrona Project **Key Observation Point:** RS-6: South Pass High-Potential Route Segment **VRM Class:** VRM Class IV	**Location:** Township: 26N Range: 104W Section: 18	**Location Sketch** 

Characteristic Landscape Description

	Landform/Water	Vegetation	Structures
Form	Flat horizontal plains with sparse irregular vertical rock formation found at the boundary of the landscape	FG: mound stippled regular MG/BG:- Low, flat, uniform	Not applicable
Line	Regular, straight	Double band created by NHT trail trace curving off into the distance	Not applicable
Color	Tan, beige, brown	Sagebrush green, olive green	Not applicable
Texture	Fine grain	Dense, medium to fine	Not applicable

Proposed Activity Description (Facility)

	Landform/Water	Vegetation	Structures
Form	Flat, horizontal	Low, flat linear clearing	Low vertical thin geometric at road and trail crossing (pipeline markers)
Line	Horizontal band	Horizontal, linear clearing	Not applicable
Color	Tan, beige	Tan, beige	Not applicable
Texture	Fine grain	Fine grain	Not applicable

Distance Zones – FG = Foreground, MG = Middleground, BG = Background

Degree of Contrast

		Features											
		Landform/ Water Body				Vegetation				Structures			
Degree of Contrast		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form			■			■					■	
	Line			■			■						■
	Color		■				■						■
	Texture			■			■						■

Does project design meet visual resource management objectives?
Yes

Additional mitigating measures recommended?
Yes

Evaluator Name(s):
EPG Visual Personnel

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Rock Springs
Resource Area:
Activity (program): Pipeline Project

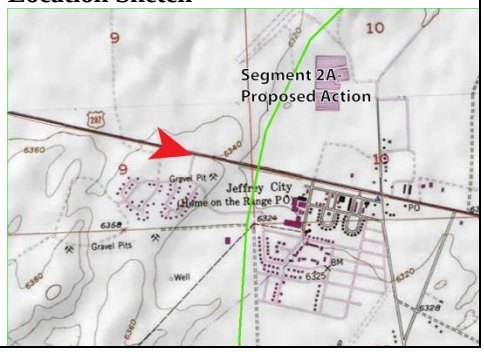
Photo taken toward the south west on NHT South Pass High Potential Route Segment facing Proposed Action

Moderate contrast would result from the construction and operation of the proposed Project within this panoramic landscape. The Project would cross the trail creating a horizontal line in the vegetation which would not be highly visible due to the angle at which the Project would be viewed. The low nature of the Project combined with the color of the vegetation and color of the landform would decrease the visibility of the Project contrast. Through the application of Selective Mitigation Measures 5, 8, and 9, contrast introduced by the Project would be reduced.

The setting of the South Pass High Potential Segment Trail Trace provides an intact setting without any cultural modifications around this segment of the trail and would appear as it would have during its historical period of significance.

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Lander
Resource Area:
Activity (program): Pipeline Project

Project Name: Riley Ridge to Natrona Project **Key Observation Point:** L-1: U.S. Highway 287 (Jeffery City)/NHT Auto Tour Route **VRM Class:** VRM Class IV	**Location:** Township: 29N Range: 92W Section: 9	**Location Sketch** 

Characteristic Landscape Description

	Landform/Water	Vegetation	Structures
Form	Gentle slopes, plain	Regular, stippled	Cubic, repeating vertical, rectangular, spherical
Line	Horizontal, diagonal continuous	Broken, butt edges	Vertical, thin, straight concave, parallel
Color	Grey, tan, brown	Light green, yellow,	Peach, light blue, grey, brown, yellow, white, silver
Texture	Medium grain	Uneven, gradation	Smooth (buildings) Uniform coarse grain

Proposed Activity Description (Facility)

	Landform/Water	Vegetation	Structures
Form	Horizontal low Flat	Low flat linear clearing	Low vertical thin geometric at road crossing (pipeline markers)
Line	Horizontal	Horizontal band	Not applicable
Color	Tan, brown	Tan, brown	Not applicable
Texture	Fine grain	Fine grain	Not applicable

Distance Zones – FG = Foreground, MG = Middleground, BG = Background

Degree of Contrast

Degree of Contrast		Features											
		Landform/ Water Body				Vegetation				Structures			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form			■				■				■	
	Line			■				■					■
	Color			■				■					■
	Texture			■				■					■

Does project design meet visual resource management objectives?
Yes

Additional mitigating measures recommended?
No

Evaluator Name(s):
EPG Visual Personnel

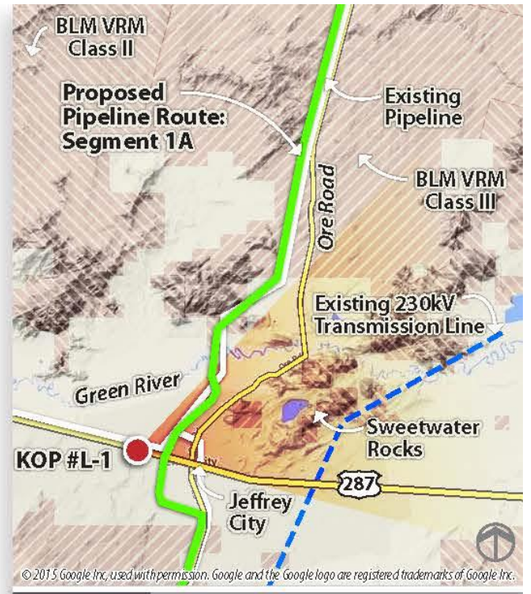
VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Lander
Resource Area:
Activity (program): Pipeline Project

Photo taken toward the east on pull off on U.S. Highway 287 towards Segment 3B

Weak contrast would result from construction and operation of the Project in this BLM VRM Class IV landscape. The Project would be moderately visible throughout the linear KOP. Due to existing modifications in the area and the low horizontal clearing associated with the right-of-way, the Project would minimally modify the views after construction of the Project.

Existing Condition View looking northeast from U.S. Highway 287 (NHT Auto Tour Route) west of Jeffrey City toward the California, Pony Express, and Oregon NHTs



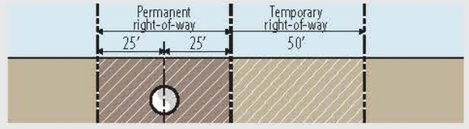
Viewing Location Viewpoint located approximately 0.3 miles from proposed pipeline route

Simulated Condition View of Segment 3A-Proposed Action, Segment 3B-Lost Creek to Lost Cabin, and Segment 3C-Lost Creek to Highway 20/26

Photo Date and Time: July 21, 2015, 3:49 p.m.

Focal Length: 50mm (The original photographs were taken at 50mm, then stitched together to create this panorama, resulting in an approximately 65-degree field of view)

Right-of-Way Section:



This simulation and right-of-way section are for illustrative purposes only. The project depicted in the simulation reflects preliminary route information. Final pipeline route and right-of-way section will differ based on final engineering and design.

Riley Ridge to Natrona Project

KOP #L-1: U.S. Highway 287 (Jeffrey City)/NHT Auto Tour Route

DRAFT October 2016

THIS PAGE INTENTIONALLY LEFT BLANK

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Lander
Resource Area:
Activity (program): Pipeline Project

Project Name: Riley Ridge to Natrona Project	**Location:**	**Location Sketch**
Key Observation Point: L2: South Pass (East) High Potential Route Segment (California, Pony Express, and Oregon NHTs)	Township: 30N Range: 92W	
VRM Class: VRM Class II	Section: 35	

Characteristic Landscape Description

	Landform/Water	Vegetation	Structures
Form	Mostly flat valley plains with gentle roll	Short, full, continuous	Tall vertical, short vertical repetitive, cubic rectangular prism
Line	Horizontal, undulating diagonal	Band and soft edge created by color change in distance	Vertical repetitive
Color	Tan, beige	Sage green, olive green , yellow	Brown, white
Texture	Fine grain to rough rock formation	Dense, medium texture	Uniform coarse grain

Proposed Activity Description (Facility)

	Landform/Water	Vegetation	Structures
Form	Not applicable	Not applicable	Not applicable
Line	Not applicable	Not applicable	Not applicable
Color	Not applicable	Not applicable	Not applicable
Texture	Not applicable	Not applicable	Not applicable

Distance Zones – FG = Foreground, MG = Middleground, BG = Background

Degree of Contrast

		Features											
		Landform/ Water Body				Vegetation				Structures			
Degree of Contrast		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form												
	Line												
	Color												
	Texture												

Does project design meet visual resource management objectives?
Yes

Additional mitigating measures recommended?
No

Evaluator Name(s):
EPG Visual Personnel

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Lander
Resource Area:
Activity (program): Pipeline Project

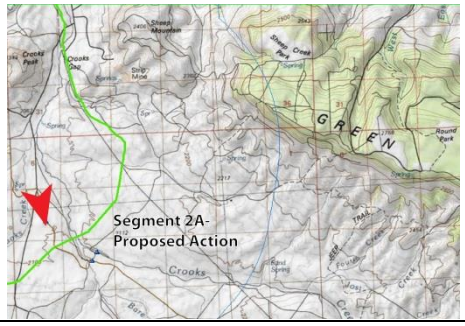
Photo taken toward the west toward Private Property

Weak contrast would result from construction and operation of the Project in this BLM VRM Class II landscape due to limited visibility from publically accessible viewing locations. The Project would be minimally visible from this location in an area modified by an existing transmission line. Due to existing modifications in the area and the low horizontal clearing associated with the right-of-way, the Project would minimally modify the views after construction of the Project.

Due to the inaccessibility to the trail, it was not possible analyze the setting intactness from the trail itself.

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Lander
Resource Area:
Activity (program): Pipeline Project

Project Name: Riley Ridge to Natrona Project **Key Observation Point:** L3: Continental Divide National Scenic Trail **VRM Class:** VRM Class III	**Location:** Township: 27N Range: 92W Section: 7	**Location Sketch** 

Characteristic Landscape Description

	Landform/Water	Vegetation	Structures
Form	Smooth rolling, gradual slopes	Stippled low growing regular mounds	Vertical geometric repetitive
Line	Horizontal regular	Curvilinear band, Simple, Soft, Flowing	Horizontal, Straight
Color	Tan , beige	Pastel yellow green	Dark brown
Texture	Fine grain	Moderate to fine texture	Moderate grain

Proposed Activity Description (Facility)

	Landform/Water	Vegetation	Structures
Form	Horizontal level	Low Growing	Low vertical thin geometric at road and trail crossing (pipeline markers)
Line	Horizontal, diagonal	Diagonal band	Not applicable
Color	Tan beige	Tan beige	Not applicable
Texture	Fine	Fine	Not applicable

Distance Zones – FG = Foreground, MG = Middleground, BG = Background

Degree of Contrast

		Features											
		Landform/ Water Body				Vegetation				Structures			
Degree of Contrast		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form		■				■					■	
	Line		■				■						■
	Color			■			■						■
	Texture			■			■						■

Does project design meet visual resource management objectives?
Yes

Additional mitigating measures recommended?
No

Evaluator Name(s):
EPG Visual Personnel

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Lander
Resource Area:
Activity (program): Pipeline Project

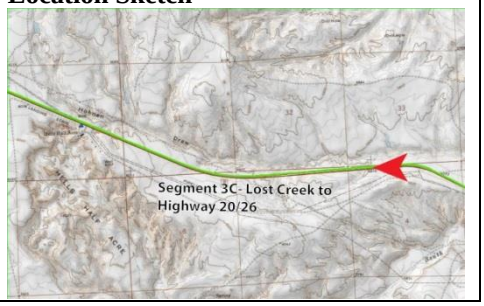
Photo taken near the Continental Divide National Scenic Trail south towards Proposed Action

Weak to moderate contrast would result from construction and operation of the Project in this BLM VRM Class III landscape. The pipeline right-of-way would cross the National Scenic Trail at a perpendicular angle, in proximity to an existing transmission line, and due to the gradual sloping nature of the landscape the right-of-way will be intermittently visible. Through the application of Selective Mitigation Measure 1, to bore under the trail, contrast introduced by the Project would be reduced.

The setting of the trail shown above would appear moderately intact. With present cultural modifications as transmissions lines, two tracks, fences and access roads for utilities in the area. The views would be moderately different to those of the period of significance.

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Casper
Resource Area:
Activity (program): Pipeline Project

Project Name: Riley Ridge to Natrona Project **Key Observation Point:** C1: U.S. Highway 20 **VRM Class:** VRM Class IV	**Location:** Township: 35N Range: 85W Section: 4	**Location Sketch** 

Characteristic Landscape Description

	Landform/Water	Vegetation	Structures
Form	Small valley created by gentle rolling slopes	Regular linear	Repeating vertical
Line	Rolling diagonal	Diagonal, butt edge parallel	Repeating vertical
Color	Tan, light brown	Yellow, green, brownish red	Brown grey white, yellow, dark grey
Texture	Fine grain	Fine grain	Uniform coarse grain, Smooth

Proposed Activity Description (Facility)

	Landform/Water	Vegetation	Structures
Form	Low parallel	Low parallel clearing	Low vertical thin geometric at road crossing (pipeline markers)
Line	Parallel band	Parallel band	Not applicable
Color	Brown	Brown	Not applicable
Texture	Fine grain	Fine grain	Not applicable

Distance Zones – FG = Foreground, MG = Middleground, BG = Background

Degree of Contrast

		Features											
		Landform/ Water Body				Vegetation				Structures			
Degree of Contrast		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form			■			■					■	
	Line			■				■					■
	Color		■					■					■
	Texture		■					■					■

Does project design meet visual resource management objectives?
Yes

Additional mitigating measures recommended?
No

Evaluator Name(s):
EPG Visual Personnel

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Casper
Resource Area:
Activity (program): Pipeline Project

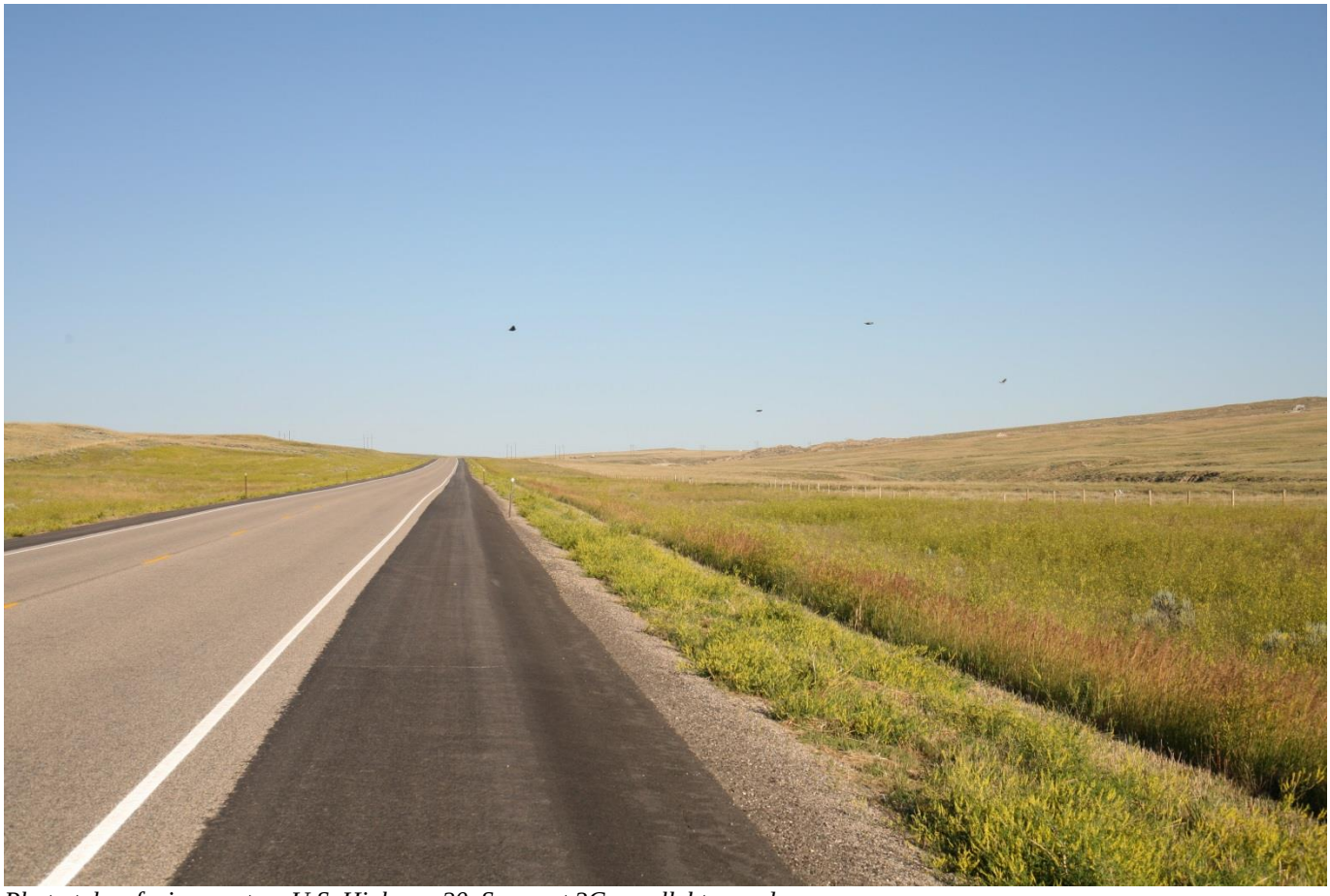
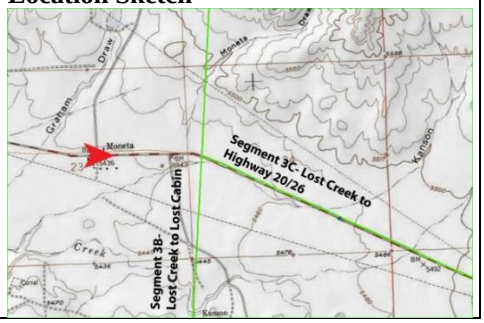


Photo taken facing west on U.S. Highway 20, Segment 3C parallel to road

Weak contrast would result from the construction and operation of the Project in this BLM VRM Class IV landscape. The Project would create an adjacent band running parallel to the road. Due to the proximity of the Project to the travel route the Project, a stronger contrast would occur during construction however, once completed; the Project would be minimally visible while traveling U.S. Highway 26 in vegetation communities with a short revegetation period

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Casper
Resource Area:
Activity (program): Pipeline Project

Project Name: Riley Ridge to Natrona Project **Key Observation Point:** C1: U.S. Highway 26 **VRM Class:** VRM Class IV	**Location:** Township: 37N Range: 91W Section: 23	**Location Sketch** 

Characteristic Landscape Description

	Landform/Water	Vegetation	Structures
Form	Flat, gentle low rolling	Broken, bunches of irregular stippled mounds through low growing vegetation	Vertical thin repeating rectangular
Line	Horizontal diagonal	Butt edged with parallel band	Vertical repeating
Color	Tan, brown	Yellow, orange green, brown	Grey white, yellow, dark grey, green
Texture	Fine grain	Fine grain to medium grain	Uniform coarse grain

Proposed Activity Description (Facility)

	Landform/Water	Vegetation	Structures
Form	Flat, gentle low rolling	Low Clearing	Low vertical thin geometric at road crossing (pipeline markers)
Line	Horizontal and diagonal line	Low Clearing	Not applicable
Color	Brown	Brown	Not applicable
Texture	Fine grain	Fine grain	Not applicable

Distance Zones – FG = Foreground, MG = Middleground, BG = Background

Degree of Contrast

		Features											
		Landform/ Water Body				Vegetation				Structures			
Degree of Contrast		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form			■			■					■	
	Line			■			■						■
	Color		■					■					■
	Texture			■				■					■

Does project design meet visual resource management objectives?
Yes

Additional mitigating measures recommended?
No

Evaluator Name(s):
EPG Visual Personnel

VISUAL CONTRAST RATING WORKSHEET

Date: 8/14/2015
District/Field Office: Casper
Resource Area:
Activity (program): Pipeline Project

Photo taken facing east on U.S. Highway 20, Segment 3C parallel to road

Weak contrast would result from the construction and operation of the proposed Project within the landscape. The Project would cross the view at a perpendicular angle approximately 0.5 mile away in proximity to existing transmission lines and pipelines.

Appendix E – Grazing Allotment Supporting Data

APPENDIX E – GRAZING ALLOTMENT SUPPORTING DATA

E.1 Introduction

Table E-1 through Table E-3 are lists of the grazing allotments crossed by each alternative route for each Bureau of Land Management (BLM) field office. This information supports the livestock grazing inventory and impact assessment. The inventory and analysis are included in the Environmental Impact Statement and for the Riley Ridge to Natrona Project in Section 4.3.5.

Table E-1
Grazing Allotments on Bureau of Land Management Administered Land for Segment 1 Alternative Routes

Allotment	Total Acres of Allotment	Miles Crossed	Acres of Temporary Disturbance[1,4,5]	Acres of Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]
Alternative 1A: Proposed Action					
Pinedale Field Office					
S Piney Ranch Ind	977	1.0	11	1	6
N. Labarge Com	135,000	12.3	128	9	78
Beaver Cr. Ind	934	1.5	15	1	9
Beaver Cr. Meadow Ind	1,974	1.9	20	1	12
Labarge Unit Ind	2,103	2.1	22	2	14
Rock Springs Field Office					
Figure 4	119,080	7.7	80	5	49
Total for 1A	**260,068**	**26.5**	**276**	**19**	**168**
Alternative 1A Variation: Dry Basin Draw					
Pinedale Field Office					
S Piney Ranch Ind	977	1.0	11	1	6
N. Labarge Com	135,000	12.6	131	9	80
Beaver Cr. Ind	934	1.5	15	1	9
Beaver Cr. Meadow Ind	1,974	1.9	20	1	12
Labarge Unit Ind	2,103	2.1	22	2	14
Rock Springs Field Office					
Figure 4	119,080	7.7	80	5	49
Total for 1A Variation	**260,068**	**26.8**	**280**	**19**	**169**
Alternative 1B: Dry Piney					
Pinedale Field Office					
S Piney Ranch Ind	977	1.0	11	1	6
N. Labarge Com	135,000	13.2	137	9	83
Dry Piney Ind	1,899	3.3	34	2	21
Beaver Cr. Ind	934	1.5	15	1	9
Beaver Cr. Meadow Ind	1,974	1.9	20	1	12
Labarge Unit Ind	2,103	2.1	80	5	49
Rock Springs Field Office					
Figure 4	119,080	7.7	80.2	5.4	49
Total for 1B	**261,967**	**30.7**	**320**	**21**	**194**
Alternative 1C: Figure Four					
Pinedale Field Office					
S Piney Ranch Ind	977	1.0	11	1	6
N. Labarge Com	135,000	18.4	191	11	116

Table E-1
Grazing Allotments on Bureau of Land Management Administered Land for Segment 1 Alternative Routes

Allotment	Total Acres of Allotment	Miles Crossed	Acres of Temporary Disturbance[1,4,5]	Acres of Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]
Beaver Cr. Ind	934	1.5	15	1	9
Beaver Cr. Meadow Ind	1,974	1.9	20	1	12
Labarge Unit Ind	2,103	2.1	22	1	14
Rock Springs Field Office					
Figure 4	119,080	9.5	99	6	60
Total for 1C	**260,068**	**34.4**	**358**	**21**	**217**

SOURCE: Calculations in this table are derived from information provided in the Applicant's Project description.
NOTES:
[1]Temporary disturbance includes estimated area of disturbance associated with the temporary right-of-way, additional temporary work spaces, staging areas, temporary disturbance at the Sweetening Plant, temporary disturbance associated with the H_2S (hydrogen sulfide) acid gas injection wells and flowlines, and temporary disturbance associated with the 69-kilovolt (kV) transmission line.
[2]Permanent disturbance includes estimated area of disturbance associated with pipeyards, access roads outside of the permanent right-of-way, mainline valves, pig launcher/receiver sites, the Sweetening Plant, permanent disturbance associated with the H_2S acid gas injection wells and flowlines, the substation, and the Bairoil Valve Site Interconnect.
[3]Permanent right-of-way reclaimed includes the portion of the permanent right-of-way that will be reclaimed after construction. The disturbance in the permanent right-of-way associated with the pig launcher/receiver sites, the Sweetening Plant, mainline valves, and Bairoil Valve Site are not included
[4]Disturbance has not been associated with the distribution lines. Additional information has been requested from the applicant.
[5]Calculations include an additional 5 percent contingency.
Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table E-2
Grazing Allotments on Bureau of Land Management Administered Land for Segment 2 Alternative Routes

Allotment	Total Acres of Allotment	Miles Crossed	Acres of Temporary Disturbance[1,4,5]	Acres of Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]
Alternative 2A: Proposed Action					
Lander Field Office					
Crooks Gap	3,413	0.2	2	<1	1
Arapahoe Creek	258,518	20.3	294	20	132
Osa	94,400	0.2	3	<1	1
Rock Springs Field Office					
Little Sandy	113,064	9.2	134	9	60
Reservoir	37,147	9.0	130	9	58
Pacific Creek	197,609	14.8	215	15	96
Red Desert	256,489	19.5	283	20	127
Bush Rim	98,821	19.4	282	19	126
Figure 4	119,080	8.7	127	9	57
Sublette	73,506	15.9	231	16	104
Rawlins Field Office					
Cyclone Rim	308,608	11.7	170	12	76
Total for 2A	**1,560,655**	**129.0**	**1,871**	**129**	**839**
Alternative 2B: Southern Route					
Lander Field Office					
Crooks Gap	3,413	0.2	2	<1	1.1
Arapahoe Creek	258,518	20.3	294	20	132
Osa	94,400	0.2	3	<1	1
Rock Springs Field Office					
Fourth of July	21,810	9.7	140	10	63
Pacific Creek	197,609	2.5	36	3	16
Red Desert	256,489	23.3	338	23	152
Sands	110,297	16.8	244	17	109
Eighteen Mile	246,003	19.8	287	20	129
Rock Springs	2,200,000	8.2	119	8	53
Figure 4	119,080	10.9	158	11	71
Big Sandy	59,780	1.5	22	2	10
Highway Gasson	99,172	11.0	160	11	72
Rawlins Field Office					
Cyclone Rim	306,140	11.7	170	12	76
Total for 2B	**3,666,571**	**136.1**	**1,973**	**136**	**885**

SOURCE: Calculations in this table are derived from information provided in the Applicant's Project description.
NOTES:
[1]Temporary disturbance includes estimated area of disturbance associated with the temporary right-of-way, additional temporary work spaces, staging areas, temporary disturbance at the Sweetening Plant, temporary disturbance associated with the H_2S acid gas injection wells and flowlines, and temporary disturbance associated with the 69kV transmission line.
[2]Permanent disturbance includes estimated area of disturbance associated with pipeyards, access roads outside of the permanent right-of-way, mainline valves, pig launcher/receiver sites, the Sweetening Plant, permanent disturbance associated with the H_2S acid gas injection wells and flowlines, the substation, and the Bairoil Valve Site Interconnect.
[3]Permanent right-of-way reclaimed includes the portion of the permanent right-of-way that will be reclaimed after construction. The disturbance in the permanent right-of-way associated with the pig launcher/receiver sites, the Sweetening Plant, mainline valves, and Bairoil Valve Site are not included.
[4]Disturbance has not been associated with the distribution lines. Additional information has been requested from the applicant.
[5]Calculations include an additional 5 percent contingency.
Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table E-3 Grazing Allotments on Bureau of Land Management Administered Land for Segment 3 Alternative Routes					
Allotment	**Total Acres of Allotment**	**Miles Crossed**	**Acres of Temporary Disturbance[1,4,5]**	**Acres of Permanent Disturbance[2,4,5]**	**Permanent Right-of-Way Reclaimed[3,4,5]**
Alternative 3A: Proposed Action					
Casper Field Office					
Matador	34,007	6.3	89	4	40
F.L. Ranch	88,658	4.1	59	3	26
Ervay Basin	21,161	5.8	82	4	37
M & D	21,535	3.6	51	2	23
Forgey Place	44,165	8.3	118	5	53
Eccles	13,816	2.9	41	2	19
Wyatt Place	16,571	3.2	45	2	20
Lander Field Office					
Muskrat Open	111,276	5.1	3	32	72
JJ Winter Pastures	5,847	2.6	2	17	37
Tram Road Pasture	1,719	2.0	1	13	28
Granite Mountain Open	82,672	8.9	6	56	125
Crooks Gap	3,413	2.3	2	15	33
Mitchell Pasture	1,824	1.5	1	10	22
Fraser Draw	100,711	0.9	1	6	13
Gas Hills	55,870	15.3	10	97	216
East Allotment	6,227	7.5	5	48	107
Arapahoe Creek	258,518	0.1	1	0.0	<1
Mountain	36,320	0.3	4	<1	2
OSA	94,400	0.6	8	<1	4
Total for 3A	**998,710**	**81.1**	**529**	**316**	**877**
Alternative 3B: Lost Creek to Lost Cabin					
Lander Field Office					
North Of CB&Q R.R.	1,887	0.2	3	<1	2
South Of CB&Q RR	7,279	2.7	38	2	17
North Of Tracks	18,498	3.0	43	2	19
Moneta Hills Pasture	8,979	3.0	43	2	19
Madden Ranch Pasture	6,062	1.2	18	1	8
Muskrat Open	111,276	5.1	72	3	32
JJ Winter Pastures	5,847	2.6	37	2	17
Tram Road Pasture	1,719	2.0	28	1	13
Granite Mountain Open	82,672	8.9	125	6	56
Crooks Gap	3,413	2.3	33	2	15
Mitchell Pasture	1,824	1.5	22	1	10
Muskrat-Linn	86,531	5.8	82	4	37
Fraser Draw	100,711	16.7	236	11	106
Gas Hills	55,870	9.3	131	6	59
East Allotment	6,227	7.5	107	5	48
Arapahoe Creek	258,518	0.1	1	0	<1
Mountain	36,320	0.3	4	<1	2
OSA	94,400	0.6	9	<1	4
Total for 3B	**888,034**	**72.8**	**1,031**	**48**	**462**

Table E-3
Grazing Allotments on Bureau of Land Management Administered Land for Segment 3 Alternative Routes

Allotment	Total Acres of Allotment	Miles Crossed	Acres of Temporary Disturbance[1,4,5]	Acres of Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]
Alternative 3C: Lost Creek to Highway 20/26					
Casper Field Office					
OSA	4	0.0	0	0	0
Lander Field Office					
Muskrat Open	111,276	5.1	72	3	32
JJ Winter Pastures	5,847	2.6	37	2	17
Tram Road Pasture	1,719	2.0	28	1	13
Granite Mountain Open	82,672	8.9	125	6	56
Crooks Gap	3,413	2.3	33	2	15
Mitchell Pasture	1,824	1.5	22	1	10
Muskrat-Linn	86,531	7.6	107	5	48
Fraser Draw	100,711	16.7	236	11	106
Gas Hills	55,870	9.3	131	6	59
East Allotment	6,227	7.5	107	5	48
Arapahoe Creek	258,518	0.1	1	0	<1
Mountain	36,320	0.3	4	<1	2
OSA	94,400	7.4	105	5	47
Total for 3C	**845,332**	**71.3**	**1,008**	**46**	**452**

SOURCE: Calculations in this table are derived from information provided in the Applicant's Project description.
NOTES:
[1]Temporary disturbance includes estimated area of disturbance associated with the temporary right-of-way, additional temporary work spaces, staging areas, temporary disturbance at the Sweetening Plant, temporary disturbance associated with the H_2S acid gas injection wells and flowlines, and temporary disturbance associated with the 69kV transmission line.
[2]Permanent disturbance includes estimated area of disturbance associated with pipeyards, access roads outside of the permanent right-of-way, mainline valves, pig launcher/receiver sites, the Sweetening Plant, permanent disturbance associated with the H_2S acid gas injection wells and flowlines, the substation, and the Bairoil Valve Site Interconnect.
[3]Permanent right-of-way reclaimed includes the portion of the permanent right-of-way that will be reclaimed after construction. The disturbance in the permanent right-of-way associated with the pig launcher/receiver sites, the Sweetening Plant, mainline valves, and Bairoil Valve Site are not included
[4]Disturbance has not been associated with the distribution lines. Additional information has been requested from the applicant.
[5]Calculations include an additional 5 percent contingency.
Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix F – Wild Horse and Burro Herd Management Areas Supporting Data

APPENDIX F – WILD HORSE AND BURRO HERD MANAGEMENT AREAS SUPPORTING DATA

F.1 Introduction

Table F-1 through Table F-3 are lists of the wild horse and burro herd management areas crossed by each alternative route for each Bureau of Land Management BLM) field office. This information supports the wild horse and burro inventory and impact assessment. The inventory and analysis are included in the Environmental Impact Statement and for the Riley Ridge to Natrona Project in Section 4.3.22.

Table F-1
Wild Horse and Burro Herd Management Areas on
Bureau of Land Management Administered Land for Segment 1 Alternative Routes

Herd Management Area	Total Acres	Miles Crossed	Acres of Temporary Disturbance[1,4,5]	Acres of Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]
Alternative 1A: Proposed Action					
Pinedale Field Office					
Little Colorado	228	0.3	3	<1	2
Rock Springs Field Office					
Little Colorado	629,730	7.7	80	5	49
Total for 1A	**629,958**	**8.0**	**83**	**6**	**51**
Alternative 1A Variation: Dry Basin Draw					
Pinedale Field Office					
Little Colorado	228	0.3	3	<1	2
Rock Springs Field Office					
Little Colorado	629,730	7.7	80	5	49
Total for 1A Variation	**629,958**	**8.0**	**83**	**6**	**51**
Alternative 1B: Dry Piney					
Pinedale Field Office					
Little Colorado	228	0.3	3	<1	2
Rock Springs Field Office					
Little Colorado	629,730	7.7	80	5	49
Total for 1B	**629,958**	**8.0**	**83**	**6**	**51**
Alternative 1C: Figure Four					
Rock Springs Field Office					
Little Colorado	629,730	9.4	98	6	60
Total for 1C	**629,730**	**9.4**	**98**	**6**	**60**

SOURCE: Calculations in this table are derived from information provided in the Applicant's Project description.
NOTES:
[1]Temporary disturbance includes estimated area of disturbance associated with the temporary right-of-way, additional temporary work spaces, staging areas, temporary disturbance at the Sweetening Plant, temporary disturbance associated with the H_2S (hydrogen sulfide) acid gas injection wells and flowlines, and temporary disturbance associated with the 69-kilovolt (kV) transmission line.
[2]Permanent disturbance includes estimated area of disturbance associated with pipeyards, access roads outside of the permanent right-of-way, mainline valves, pig launcher/receiver sites, the Sweetening Plant, permanent disturbance associated with the H_2S acid gas injection wells and flowlines, the substation, and the Bairoil Valve Site Interconnect.
[3]Permanent right-of-way reclaimed includes the portion of the permanent right-of-way that will be reclaimed after construction. The disturbance in the permanent right-of-way associated with the pig launcher/receiver sites, the Sweetening Plant, mainline valves, and Bairoil Valve Site are not included
[4]Disturbance has not been associated with the distribution lines. Additional information has been requested from the applicant.
[5]Calculations include an additional 5 percent contingency.
Acreages are approximate and have been rounded to the nearest acre; therefore, the columns may not total.

Table F-2
Wild Horse and Burro Herd Management Areas on
Bureau of Land Management Administered Land for Segment 2 Alternative Routes

Herd Management Area	Total Acres	Miles Crossed	Acres of Temporary Disturbance[1,4,5]	Acres of Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]
Alternative 2A: Proposed Action					
Lander Field Office					
Antelope Hills	101,916	0.0	<1	<1	<1
Green Mountain	116,589	2.1	31	2	14
Rawlins Field Office					
Antelope Hills	56,481	10.4	151	10	67
Divide Basin	909	0.0	<1	<1	<1
Lost Creek	251,297	1.3	19	1	8
Rock Springs Field Office					
Divide Basin	776,407	29.8	433	29	193
Little Colorado	629,730	24.7	359	24	160
Total for 2A	**1,933,329**	**68.3**	**993**	**67**	**442**
Alternative 2B: Southern Route					
Lander Field Office					
Antelope Hills	101,916	0.0	<1	<1	<1
Green Mountain	116,589	2.1	31	2	14
Rock Springs Field Office					
White Mountain	391,865	10.5	152	10	68
Divide Basin	776,407	31.0	450	30	200
Little Colorado	629,730	32.8	475	32	212
Rawlins Field Office					
Antelope Hills	56,481	10.4	151	10	67
Divide Basin	909	0.0	<1	<1	<1
Lost Creek	251,297	1.3	19	1	8
Total for 2B	**2,325,194**	**88.1**	**1,279**	**86**	**570**

SOURCE: Calculations in this table are derived from information provided in the Applicant's Project description.
NOTES:
[1]Temporary disturbance includes estimated area of disturbance associated with the temporary right-of-way, additional temporary work spaces, staging areas, temporary disturbance at the Sweetening Plant, temporary disturbance associated with the H_2S acid gas injection wells and flowlines, and temporary disturbance associated with the 69kV transmission line.
[2]Permanent disturbance includes estimated area of disturbance associated with pipeyards, access roads outside of the permanent right-of-way, mainline valves, pig launcher/receiver sites, the Sweetening Plant, permanent disturbance associated with the H_2S acid gas injection wells and flowlines, the substation, and the Bairoil Valve Site Interconnect.
[3]Permanent right-of-way reclaimed includes the portion of the permanent right-of-way that will be reclaimed after construction. The disturbance in the permanent right-of-way associated with the pig launcher/receiver sites, the Sweetening Plant, mainline valves, and Bairoil Valve Site are not included
[4]Disturbance has not been associated with the distribution lines. Additional information has been requested from the applicant.
[5]Calculations include an additional 5 percent contingency.

Table F-3
Wild Horse and Burro Herd Management Areas on
Bureau of Land Management Administered Land for Segment 3 Alternative Routes

Herd Management Area	Total Acres	Miles Crossed	Acres of Temporary Disturbance[1,4,5]	Acres of Permanent Disturbance[2,4,5]	Permanent Right-of-Way Reclaimed[3,4,5]
Alternative 3A: Proposed Action					
Lander Field Office					
Green Mountain	116,589	0.4	5	<1	2
Muskrat Basin	193,320	13.9	198	9	89
Total for 3A	**309,909**	**14.3**	**203**	**9**	**91**
Alternative 3B: Lost Creek to Lost Cabin					
Lander Field Office					
Green Mountain	116,589	0.4	5	<1	2
Muskrat Basin	193,320	13.9	198	9	89
Total for 3B	**309,909**	**14.3**	**203**	**9**	**91**
Alternative 3C: Lost Creek to Highway 20/26					
Lander Field Office					
Green Mountain	116,589	0.4	5	<1	2
Muskrat Basin	193,320	13.9	198	9	89
Total for 3C	**309,909**	**14.3**	**203**	**9**	**91**

SOURCE: Calculations in this table are derived from information provided in the Applicant's Project description.
NOTES:
[1]Temporary disturbance includes estimated area of disturbance associated with the temporary right-of-way, additional temporary work spaces, staging areas, temporary disturbance at the Sweetening Plant, temporary disturbance associated with the H_2S acid gas injection wells and flowlines, and temporary disturbance associated with the 69kV transmission line.
[2]Permanent disturbance includes estimated area of disturbance associated with pipeyards, access roads outside of the permanent right-of-way, mainline valves, pig launcher/receiver sites, the Sweetening Plant, permanent disturbance associated with the H_2S acid gas injection wells and flowlines, the substation, and the Bairoil Valve Site Interconnect.
[3]Permanent right-of-way reclaimed includes the portion of the permanent right-of-way that will be reclaimed after construction. The disturbance in the permanent right-of-way associated with the pig launcher/receiver sites, the Sweetening Plant, mainline valves, and Bairoil valve site are not included
[4]Disturbance has not been associated with the distribution lines. Additional information has been requested from the applicant.
[5]Calculations include an additional 5 percent contingency.

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix G – Climate and Air Quality Supporting Data

APPENDIX G – CLIMATE AND AIR QUALITY SUPPORTING DATA

This appendix provides supporting data for climate and air quality analyses presented in the Riley Ridge to Natrona CO_2 Pipeline Project Draft Environmental Impact Study.

Table G-1
Riley Ridge to Natrona Sweetening Plant Construction Equipment

Vehicle or Equipment Description	HP	Number		SPC Days[1]
		PLC	SPC	
5M Side boom	60	–	3	90
Backhoe	90	–	1	4
Bending machine	59	17	–	–
Ditching Machine	350	2	–	–
Drill Rig CAT 3512B	1476	–	1	300
Excavator	300	8	4	90
Farm Tractor	120	4	–	–
Fork Lift	86		1	4
Fuel Truck	419	1	–	–
Grader	235	–	4	850
Grader	230	2	–	–
HDD Boring Machine (~1,000,000 lb thrust)	765	2	–	–
Light Duty & Medium Weight Support Vehicle	188	–	10	300
Light Weight Support Vehicles or Medium Weight Utility Vehicles	188	–	4	850
Light Weight Support Vehicles or Medium Weight Utility Vehicles, NDT Trucks, Mechanic Truck, Crew Vans	188	104	–	–
Medium - Heavy Weight Service Vehicle with Trailer (Hot Shot)	188	–	1	300
Medium/Heavy Weight Support Vehicle (trash cage/potable water truck)	280	–	1	4
Padding Machine	200	1	–	–
Rubber Tire Casing Truck (run surface & production casing)	370	–	1	225
Rubber Tire Backhoe	90	8	2	850
Rubber Tire Belly-Dump Gravel Truck	370	–	10	850
Rubber Tire Bulk Cement Pod	420	–	1	198
Rubber Tire Flat-Bed	370	–	5	225
Rubber Tire Gin Truck	280	–	1	4
Rubber Tire Haul Truck	370	–	10	300
Rubber Tire Low Boy Mobilization Tractor Trailer/Equip delivery & recovery	295	2	4	850
Rubber Tire Portable Crane	240	–	2	4
Rubber Tire Pump Truck (w/1 qty deck motor 526 hp Detroit Diesel)	425	–	2	198
Rubber Tire Scraper	425	–	4	850
Rubber Tire Water Truck	420	4	2	850
Septic Removal Vehicle	280	–	1	4
Side boom	60	18	–	–
Skid Steer - Forklift - Man basket	90	–	2	300
Tow Tractor Trailer, Stringing Truck, Skid Truck, misc. trailers/implements,	370	32	–	–

Table G-1
Riley Ridge to Natrona Sweetening Plant Construction Equipment

Vehicle or Equipment Description	HP	Number		SPC Days[1]
		PLC	SPC	
Track Dozer	140	–	4	850
Track Dozer (D8)	335	7	–	–
Welder Truck, Tack Rigs	188	22	–	–

NOTES:
[1]Sweetening plant construction emissions are calculated based on the number of days each piece of equipment would be used. Pipeline construction emissions are calculated first on a per-mile basis assuming construction requires an average of one mile per day. Per-mile emission rates are then multiplied by the length of each alternative route to calculate associated emissions.
HP = Horsepower
PLC = Pipeline construction
SPC = Sweetening Plant construction

Table G-2
Riley Ridge to Natrona Pipeline Construction Equipment Emission Factors (g/hp-hr)[1]

Vehicle or Equipment Description	Load Factor	NO_x	SO_2	CO	PM_{10}	$PM_{2.5}$	VOC Exhaust	CO_2
5M Side-boom	0.43	3.72	0.12	1.93	0.29	0.24	0.27	590
Backhoe	0.21	4.65	0.14	5.70	0.89	0.82	0.97	693
Bending Machine	0.59	3.87	0.12	2.66	0.38	0.33	0.33	595
Ditching Machine[2]	0.59	3.64	0.11	1.62	0.27	0.21	0.25	536
Drill Rig CAT 3512B	0.59	1.90	0.00	0.85	0.06	0.21	0.03	519
Excavator	0.59	2.22	0.00	0.89	0.14	0.13	0.17	536
Farm Tractor[3]	0.21	4.37	0.13	2.60	0.55	0.82	0.70	624
Fork Lift	0.59	3.05	0.00	2.75	0.37	0.36	0.30	595
Fuel Truck	0.59	1.63	0.09	0.64	0.18	0.10	0.16	536
Grader	0.59	1.82	0.10	0.62	0.19	0.12	0.18	536
HDD Boring Machine (~1,000,000 lb thrust)	0.59	3.58	0.00	1.56	0.22	0.21	0.24	536
Light Weight Support Vehicles or Medium Weight Utility Vehicles	0.59	1.13	0.09	0.27	0.15	0.04	0.15	536
Light Weight Support Vehicles or Medium Weight Utility Vehicles, NDT Trucks, Mechanic Truck, Crew Vans	0.59	1.13	0.09	0.27	0.15	0.04	0.15	536
Medium - Heavy Weight Service Vehicle with Trailer (Hot Shot)	0.59	2.83	0.10	1.11	0.29	0.16	0.25	536
Medium/Heavy Weight Support Vehicle (trash cage/potable water truck)	0.59	1.13	0.09	0.27	0.15	0.04	0.15	536
Padding Machine	0.59	2.83	0.10	1.11	0.29	0.16	0.25	536
Rubber Tire Backhoe	0.21	4.65	0.14	5.70	0.89	0.82	0.97	693
Rubber Tire Backhoe	0.21	4.65	0.14	5.70	0.89	0.82	0.97	693
Rubber Tire Belly-Dump Gravel Truck	0.59	1.63	0.09	0.64	0.18	0.10	0.16	536
Rubber Tire Bulk Cement Pod	0.59	1.63	0.09	0.64	0.18	0.10	0.16	536
Rubber Tire Casing Truck (run surface and production casing)	0.59	1.63	0.09	0.64	0.18	0.10	0.16	536
Rubber Tire Flat-Bed	0.59	1.63	0.09	0.64	0.18	0.10	0.16	536
Rubber Tire Gin Truck	0.59	1.13	0.09	0.27	0.15	0.04	0.15	536

Table G-2
Riley Ridge to Natrona Pipeline Construction Equipment Emission Factors (g/hp-hr)[1]

Vehicle or Equipment Description	Load Factor	NO_x	SO_2	CO	PM_{10}	$PM_{2.5}$	VOC Exhaust	CO_2
Rubber Tire Haul Truck	0.59	1.63	0.09	0.64	0.18	0.10	0.16	536
Rubber Tire Low Boy Mobilization Tractor Trailer/Equipment Delivery and Recovery	0.59	2.83	0.10	1.11	0.29	0.16	0.25	536
Rubber Tire Portable Crane	0.43	2.27	0.00	0.49	0.10	0.10	0.20	530
Rubber Tire Pump Truck (with 1 quantity deck motor 526 hp Detroit Diesel)	0.59	1.63	0.09	0.64	0.18	0.10	0.16	536
Rubber Tire Scraper	0.59	2.53	0.10	1.00	0.20	0.13	0.18	536
Rubber Tire Water Truck	0.59	1.63	0.09	0.64	0.18	0.10	0.16	536
Septic Removal Vehicle	0.59	1.13	0.09	0.27	0.15	0.04	0.15	536
Side Boom	0.43	3.72	0.12	1.93	0.29	0.24	0.27	590
Skid Steer - Forklift - Man basket	0.21	3.05	0.00	2.75	0.37	0.36	0.30	595
Tow Tractor Trailer, Strigging Truck, Skid Truck, Miscellaneous Trailers/Implements	0.59	1.63	0.09	0.64	0.18	0.10	0.16	536
Track Dozer	0.59	2.02	0.00	0.87	0.21	0.20	0.19	536
Track Dozer (D8)[4]	0.59	2.53	0.10	1.00	0.20	0.20	0.18	536
Welder Truck, Tack Rigs	0.59	1.13	0.09	0.27	0.15	0.04	0.15	536

NOTES:
[1]Source: NONROAD 2008a model for Sublette County. Emissions Inventory Tool for General Conformity Determinations. The model was run per EPA guidance document (http://www.epa.gov./otaq/models/nonrdmdl/nonrdmdl2008/420f09020.pdf) assuming calendar year 2015.
[2]No factor listed for trenching machine; therefore, factor for >300 hp other construction equipment was used.
[3]No factor listed; therefore, factor for smaller hp size was used.
[4]No factor listed for high hp; therefore, factor for <175 hp was used.
HP = Horsepower
MMBTU= Million metric British thermal units
$PM_{2.5}$ = Particulate matter less than 2.5 micrometers
PM_{10} = Particulate matter less than 10 micrometers
VOC = Volatile organic compounds

Table G-3 **HAP Emissions for Diesel Engines (lb/MMBtu)[1]**		
Pollutant	**(<600 hp)**	**(>600 hp)**
Acetaldehyde	7.67E-04	2.52E-05
Acrolein	9.25E-05	7.88E-06
Benzene	9.33E-04	7.76E-04
Formaldehyde	1.18E-03	7.89E-05
Naphthalene	8.48E-05	1.30E-04
Total PAH[2]	1.68E-04	2.12E-04
Toluene	4.09E-04	2.81E-04
Xylenes	2.85E-04	0.000193
Total HAP Emissions	3.43E-03	1.29E-03
Drill Rig Factors		
Pollutant	**(gr/hp-hr)**	**(lb/MMBtu)**
NO_x	1.90	0.597
CO	0.85	0.267
VOC	0.08	0.025
PM_{10}	0.06	0.018
CO_2	518.8	163.1

NOTES:
[1]Emission factor from AP-42 Chapter 3.4, Large Stationary Diesel and All Stationary Dual-fuel Engines, Table 3.4-3, Speciated Organic Compound Emission Factors for Large Uncontrolled Stationary Diesel Engines and Table 3.4-4 PAH Emission Factors for Large Uncontrolled Stationary Diesel Engine (10/96).
[2]Total PAH includes the HAP Napthalene.
HAP = Hazardous Air Pollutants
HP = Horsepower
MMBtu = Million British thermal units
PAH = Polycyclic aromatic hydrocarbons
PM_{10} = Particulate matter less than 10 micrometers
VOC = Volatile organic compounds