



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

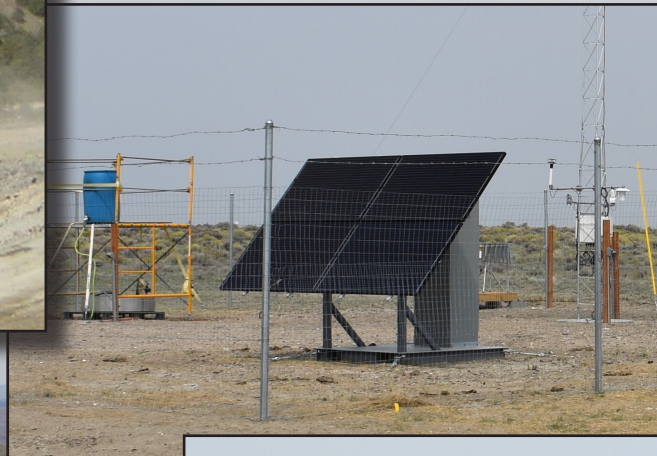
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February 2025

DRY CREEK TRONA MINE PROJECT

Final Environmental Impact Statement, DOI-BLM-WY-2022-0003-EIS



Estimated Cost to Prepare Final Environmental Impact Statement
Proponent: \$7,590,626

The BLM's multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

**DRY CREEK TRONA MINE PROJECT
FINAL ENVIRONMENTAL IMPACT STATEMENT**

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

High Desert District

Kemmerer Field Office
430 North Highway 189
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Rock Springs, Wyoming 82901-3447

February 2025



United States Department of the Interior
BUREAU OF LAND MANAGEMENT
Wyoming State Office
Cheyenne, WY 82009
<https://www.blm.gov>



In reply refer to:
3500(WYD0900)
WYWY106235167

February 2025

Dear Reader,

Attached for your review and comment is the *Dry Creek Trona Mine Project Final Environmental Impact Statement* (EIS) prepared by the Bureau of Land Management (BLM) Kemmerer and Rock Springs Field Offices. The BLM has prepared this document to provide an objective analysis of the Proposed Action and alternatives based on the best available science and to inform a BLM decision about whether to approve the Mine Plan for the Dry Creek Trona Mine Project (Project) and associated rights-of-way, as submitted to the BLM by Pacific Soda, LLC. This EIS was developed in accordance with the National Environmental Policy Act of 1969 (NEPA), Federal Land Policy and Management Act of 1976, implementing regulations, the BLM NEPA Handbook (H-1790-1), and other applicable laws and policy.

The initial proposed action proposed that all elements of the project (including all facilities, mining infrastructure, and ancillary and attendant features) would be located at the mine site, with a 21-mile railroad to connect to the Union Pacific Railroad near Granger, WY. A 24.66 mile water line would cross the U.S. Forest Service Flaming Gorge Recreation Area (USFS) and the Blacks Fork Priority Habitat Management Area (PHMA) for Greater sage-grouse to connect the processing facilities to the Green River.

The BLM Preferred Alternative, Alternative D, offers substantial changes to the project elements as described under the proposed action. The company has developed Alternative D to move the processing facilities to an area north of I-80. This moves the processing facilities closer to the main rail line, thereby eliminating the need for the rail line outside of the processing facilities boundary. The water line has been reduced to 6.4 miles and avoids USFS lands and crossing the Blacks Fork PHMA for Greater sage-grouse. A brine condensate collection system will connect the mine site to the processing facilities. Alternative D is also the preferred alternative for Pacific Soda, LLC.

This Final EIS is not a decision document. The publication of the Notice of Availability by the U.S. Environmental Protection Agency in the *Federal Register* for the Final EIS initiates a 30-day administrative waiting period, which is not a formal public comment period. However, any comments received during this time may be addressed in the Record of Decision. Comments may be submitted electronically to Kelly Lamborn at klamborn@blm.gov or submitted by mail to: BLM Kemmerer Field Office, 430 North Highway 189, Kemmerer, Wyoming 83101-9711, ATTN: Project Manager Kelly Lamborn.

INTERIOR REGION 5 • MISSOURI BASIN

KANSAS, MONTANA (Partial), NEBRASKA, NORTH DAKOTA, SOUTH DAKOTA

INTERIOR REGION 7 • UPPER COLORADO BASIN

COLORADO, NEW MEXICO, UTAH, WYOMING

Following conclusion of this 30-day waiting period, a Record of Decision for the project will be announced through local media and made available on the BLM E-Planning website:

<https://eplanning.blm.gov/eplanning-ui/project/2016395/510>.

Copies of the Final EIS have been made available to affected federal, state, and local government agencies and Native American Tribes. Bound hardcopies of the Final EIS are available for public inspection at the BLM Kemmerer Field Office, 430 North Highway 189, Kemmerer, Wyoming 83101-9711; the BLM Rock Springs Field Office, 280 Highway 191 North, Rock Springs, Wyoming 82901-3447; and the Sweetwater County Public Library, 300 North 1st East Street, Green River, Wyoming, 82935.

The Final EIS may be downloaded from the BLM Project website at no cost. Or, to request that a compact disc copy of the document be mailed to you, please send an email that includes your name and postal mailing address to klamborn@blm.gov.

We appreciate your interest in the Dry Creek Trona Mine Project EIS. If you have questions or need additional information, please contact BLM Project Manager Kelly Lamborn via U.S. mail at the address above or by sending an email to klamborn@blm.gov.

Sincerely,

FRANKLIN KEELER

Digitally signed by FRANKLIN KEELER
Date: 2025.02.07 09:07:12 -07'00'

Franklin Keeler, High Desert District Manager
Bureau of Land Management

Enclosure(s)

Dry Creek Trona Mine Project Final EIS

FINAL ENVIRONMENTAL IMPACT STATEMENT

Dry Creek Trona Mine Project

U.S. Department of the Interior
Bureau of Land Management
Wyoming State Office
Cheyenne, Wyoming
February 2025

Lead Agency: U.S. Department of the Interior, Bureau of Land Management

Type of Action: () Draft (X) Final

Responsible Official: Frank D. Keeler, Acting High Desert District Manager

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Abstract

Pacific Soda, LLC, (Pacific Soda) has been leased the rights to mine the trona resources on private lands and Bureau of Land Management (BLM)–administered lands in the Kemmerer Field Office in Sweetwater County, Wyoming. In April 2020, Pacific Soda submitted a proposal to the BLM for the Dry Creek Trona Mine Project (Project), which would consist of constructing mining facilities and employing solution mining technologies to develop its BLM leases by mining trona beds 2,300 feet below the surface and processing that trona for market. Proposed facilities include mining infrastructure, processing facilities, a co-generation plant, storage ponds, a landfill, transportation facilities, and other related utilities. Such mining-related use of public lands is allowable under both the Mineral Leasing Act of 1920 and the Federal Land Policy and Management Act of 1976.

The Project area is south of U.S. Interstate 80 and west of Wyoming State Highway 530, near the City of Green River, Wyoming. Pacific Soda estimates that approximately 23.5 million metric tons (MTs) of trona are in reserve on each section of land. Mining would occur on each section for 9 to 10 years, and mined trona would be refined to produce approximately 6.0 million MTs of marketable soda ash and 440,900 MTs of sodium bicarbonate (baking soda) per year. The proposed Project (including all facilities, mining infrastructure, and ancillary and attendant features) would disturb approximately 3,369 acres of private land, 2,947 acres of BLM-administered lands, and 9 acres of land administered by the U.S. Forest Service, all within Sweetwater County, Wyoming.

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EXECUTIVE SUMMARY

Introduction

This Final Environmental Impact Statement (EIS) documents the analysis of environmental consequences of the proposed Dry Creek Trona Mine Project (Project). Pacific Soda, LLC, (Pacific Soda) has been leased the rights to mine trona resources on private lands and Bureau of Land Management (BLM)–administered lands in the Kemmerer Field Office in Sweetwater County, Wyoming. In April 2020, Pacific Soda submitted a Project proposal to the BLM to construct mining facilities and to employ solution mining technologies to mine trona beds 2,300 feet below the surface.

The proposed Project area is south of U.S. Interstate 80 (I 80) and west of Wyoming State Highway 530, near the City of Green River, Wyoming, in the Known Sodium Leasing Area (Appendix Q, Figure 1.1-1). The Known Sodium Leasing Area is a geological designation in the Green River Basin where developable trona deposits that are at least 4 feet thick are known to occur. Proposed Project facilities include mine well fields, processing facilities, a co-generation plant, storage ponds, a landfill, transportation facilities, and utility features. The processing facilities, co-generation plant, storage ponds, and landfill are proposed in Sections 22 and 27, Township (T) 16 North (N), Range (R) 110 West (W). The mine well field would be located in Sections 23 to 26 and 35, T16N, R110W.

Pacific Soda estimates that approximately 23.5 million metric tons (MTs) of trona are in reserve on each section of land in the proposed Project area, that mining would occur on each section for 9 to 10 years, and that mined trona would be refined to produce approximately 6.0 million MTs of marketable soda ash per year. The proposed Project (including all facilities, mining infrastructure, ancillary facilities, and transportation and utility features) would collectively disturb approximately 3,369 acres of private land, 2,947 acres of BLM-administered lands, and 9 acres administered by the U.S. Forest Service (USFS), all within Sweetwater County, Wyoming.

The BLM has determined that the proposed Project requires an EIS-level analysis under the National Environmental Policy Act (NEPA). The preparation of this Final EIS is intended to assist the BLM in the decision-making process through the identification, analysis, and public disclosure of potential impacts of the Proposed Action on the human environment, including but not limited to, environmental, social, and economic impacts (42 U.S.C 4321 et seq.). Aside from BLM- and USFS-administered lands, there are no additional federal- or state-administered lands that would be disturbed by the Proposed Action. Additionally, the BLM is not aware of any other proposed activities in the Project area that would be considered, under NEPA, a connected action to the Proposed Action. An assessment of likely or potential impacts to area resources and human uses resulting from BLM approval of the proposed mining activities and construction and operations of ancillary facilities is provided in Chapter 3.

Purpose of and Need for the Action

The BLM’s purpose for the federal action is to respond to Pacific Soda’s Mine Plan to construct and operate trona mining facilities, including mine well fields, processing facilities, a co-generation plant, storage ponds, transportation facilities, utility features, and associated right-of-way (ROW) applications for linear facilities. If approved by the BLM, this would allow Pacific Soda the opportunity to develop their valid existing leases on specific public lands within the proposed Project area as authorized by the Mineral Leasing Act of 1920 (as amended) and the Federal Land Policy and Management Act of 1976. Pacific Soda would construct the mining facilities and transportation and utility features specified in the Mine Plan and Standard Form 299 applications for ROWs for linear infrastructure. The objective of

Pacific Soda would be to use these facilities and employ solution mining technologies to mine trona beds 2,300 feet below the surface and produce an estimated 6.0 million MTs of marketable soda ash per year.

The need for the federal action is established by the BLM's responsibility under the Mineral Leasing Act of 1920 (as amended) and the Federal Land Policy and Management Act of 1976. Under these statutes, the BLM is required to respond to the Project proposal and review the proposed Mine Plan and associated Standard Form 299 applications to ensure that mining activities and construction of associated facilities are consistent with leasing stipulations and other requirements mandated in the *Record of Decision and Rock Springs Resource Management Plan* (BLM 2024c) and the *Record of Decision and Approved Kemmerer Resource Management Plan* (BLM 2010a), as well as other applicable federal, state, and local statutes and regulations. This includes reviewing proposed activities on USFS lands for compliance with the *Ashley National Forest Land Management Plan* (USFS 2024b). NEPA also mandates that the BLM evaluate or analyze the impacts of the Proposed Action and develop alternatives and mitigation, when necessary, to address potential impacts to resource values and other resource uses.

Alternatives

Alternatives are the heart of any EIS because they present other possible courses of action that could achieve the underlying purpose of and need for the action to which the agency is responding. NEPA implementing regulations at 43 CFR 46.415(b) also require consideration of a no action alternative. The range of alternatives analyzed in this Final EIS, including the No Action Alternative, is summarized below. A comprehensive description of each alternative is included in Section 2.2. Other potential alternatives that were initially considered by the BLM but subsequently dismissed from detailed analysis in the EIS are described in Section 2.3. After considerable deliberation, the BLM selected Alternative D as the Agency's Preferred Alternative.

Alternative A (No Action)

Under the No Action Alternative, the Mine Plan, as currently proposed, would not be approved, and the proposal would be rejected by the BLM. If the proposal is rejected by the BLM, resource impacts would not occur. A BLM decision to select the No Action Alternative would be made in accordance with the applicable regulations at 43 CFR Part 3590, which set out the requirements and standards that a Mine Plan must meet. A BLM decision to deny the associated ROW applications will be made in accordance with the applicable regulations at 43 CFR 2804.26 and 2884.23. Under NEPA and Departmental regulations, the No Action Alternative also serves to provide a baseline for comparing anticipated impacts of the action alternatives and thus helps to better inform the BLM decision-maker with an estimate of the impacts of denying the proposed Mine Plan and/or associated ROW applications.

Alternative B (Proposed Action)

Under the Proposed Action, Pacific Soda would construct mining facilities and employ solution mining technologies to mine trona beds 2,300 feet below the surface in Sweetwater County, Wyoming. Proposed Project facilities include processing facilities, consisting of a solution mining pump station, refinery, a co-generation facility, storage and surge ponds, and a landfill. Utility infrastructure consists of a water supply pipeline, overhead transmission line, and natural gas pipeline. Transportation infrastructure includes a rail line and two access roads. The processing facilities are proposed for location in Sections 22 and 27, T16N, R110W (Figure 2.2-1). The mine well field would be in Sections 23 to 26 and 35, T16N, R110W (Appendix Q, Figure 2.2-2). Initial construction would occur over a 4-year period, followed by 23 years of operations and 7 years of decommissioning/reclamation. The total timespan of the Project from

initiation of construction activities to completion of final reclamation would be 34 years. A detailed description of the Proposed Action is included in the Mine Plan.

Alternative C

All Project elements described under Alternative B would be included under Alternative C, except that the overhead transmission line would be constructed along I 80 and extend south to be collocated with the rail line (Appendix Q, Figure 2.2-3). The other difference from Alternative B is that the access road would use an existing interchange on I 80 (Exit 61) and run along I 80 before turning south to be collocated with the rail line. These changes would collocate the transmission line, access road, and rail line and thereby reduce construction through undisturbed areas. This change would also eliminate the need to construct road improvements (widening and intersection) at the intersection of Wyoming State Highway 374 and the new access road.

Alternative D (Preferred Alternative)

Substantial changes to the Project elements described under Alternative B are proposed under Alternative D (Appendix Q, Figure 2.2-4). Although development of the mine well field and mine production levels would be unchanged, many of the processing facilities would be moved to an area north of I 80, approximately 8 miles west of Green River, Wyoming, within a designated processing facilities boundary. A water pipeline and brine solution pipeline would be constructed to connect this northern processing facility with the mine well field. The following facilities would be moved from the mine site area to the northern processing facilities boundary:

- Refinery
- Co-generation facility
- Emergency purge pond
- Topsoil stockpile
- Landfill
- Stormwater pond
- Rail loadout
- Water supply pipeline
- Rail loop track
- Natural gas pipeline
- Processing facility transmission line

Public Involvement

The BLM decision-making process is conducted in accordance with the requirements of NEPA and U.S. Department of the Interior regulations and BLM policies and procedures implementing NEPA. NEPA and the associated Departmental regulatory and policy framework require that all federal agencies involve interested groups of the public in their decision-making process, consider reasonable alternatives to proposed actions, and prepare environmental documents that disclose the potential impacts of proposed actions and alternatives. Public involvement, consultation, and coordination have been at the heart of the planning process that has led to this Final EIS. Chapter 4 contains more information about outreach

efforts, which were accomplished through public meetings, solicitation of public comments, the BLM E-Planning website, and *Federal Register* notices.

Public comments received on the Draft EIS were analyzed in detail and systematically categorized by the subject of individual comments contained in each submittal. Individual comments were tagged as either “substantive” or “nonsubstantive.” Generally speaking, substantive comments are those that call into question the accuracy of specific information provided in the Draft EIS; provide alternative sources of technical or resource information; suggest Project alternatives beyond those presented in the Draft EIS; or question, on a reasonable basis, the analytical assumptions, methodologies, or conclusions presented in the Draft EIS. Nonsubstantive comments are those that merely express an opinion, raise issues that are beyond the scope of or are irrelevant to the current Project, or take the form of vague, open-ended questions. The BLM noted and recorded nonsubstantive comments, but those comments did not receive a formal response. Comments identified as substantive, on the other hand, formed the basis for much of the revision that occurred between publication of the Draft EIS and the Final EIS. Each substantive comment is included in Appendix T along with a BLM response stating whether the comment resulted in specific changes to the document.

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Abbreviations

°F	Fahrenheit
µg/m ³	micrograms per cubic meter
µm	microns
AADT	annual average daily traffic
AAQS	Ambient Air Quality Standards
ADA	Americans with Disabilities Act
American Soda	American Soda, LLC
amsl	above mean sea level
APE	area of potential effects
Applicant	Pacific Soda, LLC
AQRV	Air Quality Related Values
ARMPA	approved resource management plan amendment
AUM	Animal Unit Month
Basin	Greater Green River Basin
bgs	below ground surface
BLM	Bureau of Land Management
BMP	best management practice
CAA	Clean Air Act
CCD	Census County Division
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH ₄	methane
cm	centimeters
CO	carbon monoxide
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalent
Core Areas	Core Population Areas
CWA	Clean Water Act
DAT	deposition analysis thresholds
dBA	A-weighted decibels
DDCT	Density and Disturbance Calculation Tool
DEQ	Wyoming Department of Environmental Quality
DPS	distinct population segment

dv	deciviews
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ERMA	Extensive Recreation Management Area
ESA	Endangered Species Act
EVT	Existing Vegetation Type
feet/day	feet per day
FLM	Federal Land Managers
FLPMA	Federal Land Policy and Management Act of 1976
GHG	greenhouse gas
GHMA	general habitat management area
GIS	geographic information system
GRB	Green River Basin
GRSG	Greater Sage-Grouse
GWP	global warming potential
HAP	hazardous air pollutant
HMA	habitat management area
HRSG	heat recovery steam generator
HUC	hydrologic unit code
HWA Wildlife	HWA Wildlife Consulting, LLC
I 80	U.S. Interstate 80
IFTDSS	Interagency Fuel Treatment Decision Support System
IMPLAN	Economic Impact Analysis for Planning
IMPROVE	Interagency Monitoring of Protected Visual Environments
ISR	in situ recovery
IWG	Interagency Working Group
KFO	Kemmerer Field Office
kg	kilogram
kg/ha/yr	kilograms per hectare per year
kg/hour/yr	kilograms per hour per year
KLJ	KLJ Engineering
km	kilometers
KOP	key observation point
KSLA	Known Sodium Leasing Area

kV	kilovolt
LQD	Land Quality Division
m	meter
MD	management decision
MEI	maximally exposed individual
MERPs	Modeled Emission Rates for Precursors
MLA	Mineral Leasing Act
MLE	most likely exposure
MOU	memorandum of understanding
MP	mile point
MT	metric ton
MTpy	metric tons per year
MW	megawatt
N	North (used in legal locations only)
N ₂ O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHD	National Hydrology Dataset
NHPA	National Historic Preservation Act
NHT	National Historic Trail
NO ₂	nitrogen dioxide
NOI	notice of intent
NO _x	nitrogen oxides
NPS	National Park System
NRA	National Recreation Area
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSO	no surface occupancy
NWI	National Wetlands Inventory
O ₃	ozone
OHV	off-highway vehicle
Pacific Soda	Pacific Soda, LLC
PFYC	Potential Fossil Yield Classification
PHMA	priority habitat management area
PILT	payments in lieu of taxes

PLSS	Public Land Survey System
PM ₁₀	particulate matter of 10 microns or less
PM _{2.5}	particulate matter of 2.5 microns or less
ppb	parts per billion
ppm	parts per million
Project	Dry Creek Trona Mine Project
Project West	Project West Trona Mine Project
PSD	Prevention of Significant Deterioration
psi	pounds per square inch
R	Range (used in legal locations only)
RAP	Rangeland Analysis Platform
Real West	Real West Natural Resource Consulting
RELs	Reference Exposure Levels
RfCs	Reference Concentrations
RFFA	reasonably foreseeable future actions
RMP	Resource Management Plan
ROS	rate of spread
ROW	right-of-way
RSFO	Rock Springs Field Office
RV	recreational vehicle
SAR	sodium absorption ratio
SDWA	Safe Drinking Water Act
SF-299	Standard Form 299
SFA	Sagebrush Focal Area
SGCN	Species of Greatest Conservation Need
Shell Valley	Shell Valley Consulting Associates
SHPO	State Historic Preservation Office
SIL	Significant Impact Level
SIO	Scenery Integrity Objective
Sisecam	Sisecam Wyoming LLC
SLRU	Sensitivity Level Rating Unit
SO ₂	sulfur dioxide
SO _x	sulfur oxides
SPCC	Spill Prevention, Control, and Countermeasures
SQRU	Scenic Quality Rating Unit

SRMA	Special Recreation Management Area
SSS	special status species
STIP	Wyoming Statewide Transportation Improvement Program
SWCA	SWCA Environmental Consultants
T	Township (used in legal locations only)
TCP	traditional cultural place
TDDD	timing, distance, density, and disturbance
tpy	tons per year
UMR	Ultimate Maximum Recovery
US 191	U.S. Highway 191
US 30	U.S. Highway 30
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compound
VRI	Visual Resource Inventory
VRM	Visual Resource Management
W	West (used in legal locations only)
WAAQS	Wyoming Ambient Air Quality Standards
WDOR	Wyoming Department of Revenue
WER	wind erodibility rating
WGFD	Wyoming Game and Fish Department
WOTUS	Waters of the United States
WPCI	Wyoming Pipeline Corridor Initiative
WY 372	Wyoming State Highway 372
WY 374	Wyoming State Highway 374
WY 530	Wyoming State Highway 530
WYDOT	Wyoming Department of Transportation
WYNDD	Wyoming Natural Diversity Database

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CHAPTER 1. PURPOSE OF AND NEED FOR THE ACTION

1.1 Introduction

This Final Environmental Impact Statement (EIS) documents the analysis of environmental consequences of the proposed Dry Creek Trona Mine Project (Project). Pacific Soda, LLC, (Pacific Soda) has been leased the rights to mine trona resources on private lands and Bureau of Land Management (BLM)–administered lands in the Kemmerer Field Office (KFO) in Sweetwater County, Wyoming. In April 2020, Pacific Soda submitted a Project proposal to the BLM to construct mining facilities and to employ solution mining technologies to mine trona beds 2,300 feet below the surface.

Trona is a sodium carbonate compound that is mined and generally processed into soda ash, which is used to manufacture many products, such as baking soda, detergents, glass, and paper. Trona resources on federal lands are classified as leasable minerals and are leased under Code of Federal Regulations (CFR) 3500 (Leasing of Solid Minerals Other Than Coal and Oil Shale).

The proposed Project area is south of U.S. Interstate 80 (I 80) and west of Wyoming State Highway 530 (WY 530) near the City of Green River, Wyoming, in the Known Sodium Leasing Area (KSLA) (Appendix Q, Figure 1.1-1). The KSLA is a geological designation in the Green River Basin (GRB) where developable trona deposits that are at least 4 feet thick are known to occur. Proposed Project facilities include mine well fields, processing facilities, a co-generation plant, storage ponds, a landfill, transportation facilities, and utility features. The processing facilities, co-generation plant, storage ponds, and landfill are proposed for Sections 22 and 27, Township (T) 16 North (N), Range (R) 110 West (W). The mine well field would be in Sections 23 to 26 and 35, T16N, R110W.

Pacific Soda submitted an Application for Transportation and Utility Systems and Facilities on Federal Lands (Standard Form 299 [SF-299]) to the BLM on November 5, 2020, for the Project-related transportation and utility features, including a water supply pipeline, rail line, access road, and overhead transmission line. Pacific Soda submitted a second SF-299 application to the BLM on December 21, 2020, for a natural gas pipeline. These infrastructure features are proposed to cross a combination of private lands and U.S. Forest Service (USFS)- and BLM-administered lands in T16 to 19N, R107 to 111W, 6th Principal Meridian. The SF-299 applications are considered to be part of the Proposed Action, and the impacts resulting from the associated linear features are analyzed in this Final EIS. The BLM's decisions on the right-of-way (ROW) applications will be made in accordance with the authority provided by Title V of Federal Land Policy and Management Act of 1976 (FLPMA) (43 United States Code [USC] 1761 et seq.) and under the procedures described at 43 CFR 2800 for the proposed linear facilities other than the natural gas pipeline, which will be considered by the BLM in accordance with the authority provided by Section 28 of the Mineral Leasing Act (MLA) (30 USC 185) and under the procedures described at 43 CFR 2880.

Pacific Soda estimates that approximately 23.5 million metric tons (MTs) of trona are in reserve on each section of land in the proposed Project area, that mining would occur on each section for 9 to 10 years, and that mined trona would be refined to produce approximately 6.0 million MTs of marketable soda ash per year. The proposed Project (including all facilities, mining infrastructure, ancillary facilities, and transportation and utility features) would collectively disturb approximately 3,369 acres of private land, 2,947 acres of BLM-administered lands, and 9 acres administered by the USFS, all within Sweetwater County, Wyoming.

The BLM has determined that the proposed Project requires an EIS-level of analysis under the National Environmental Policy Act (NEPA). The preparation of this Final EIS is intended to assist the BLM in the

decision-making process through the identification, analysis, and public disclosure of potential impacts of the Proposed Action on the human environment, including but not limited to, environmental, social, and economic impacts.¹ Aside from BLM- and USFS-administered lands, there are no additional federal- or state-administered lands that would be disturbed by the Proposed Action. Additionally, the BLM is not aware of any other proposed activities in the Project area that would be considered, under NEPA, a connected action to the Proposed Action. An assessment of likely or potential impacts to area resources and human uses resulting from BLM approval of the proposed mining activities and construction and operation of ancillary facilities is provided in Chapter 3.

1.2 Trona Mining History and Background

The GRB is estimated to hold nearly 90% of the world's known trona resources, which produces 95% of United States' soda ash and 38% of the world's soda ash supply (BLM 2012a). Trona was discovered in this area in 1938, and commercial soda ash production began in 1948. The KSLA was established by the U.S. Geological Survey (USGS) in 1954 and updated in 1978, covering an area of approximately 684,000 acres. Within the KSLA, trona mining is currently conducted by four operators: Genesis Alkali Wyoming L.P. (formerly FMC Wyoming Corporation), Sisecam Wyoming LLC (Sisecam) (formerly OCI Wyoming, L.P.), Tata Chemicals, and American Soda, LLC (American Soda) (formerly Solvay Chemical). Most trona mining in the KSLA is conducted using conventional room-and-pillar and longwall mining methodologies. Solution/in situ mining represents a small portion of total trona production within the KSLA. Total combined average production from all trona mines in the GRB over the last 3 years was 17.3 million MTs according to the Annual Report of the State Inspector of Mines 2022.

1.3 Purpose of and Need for the Action

The BLM's purpose for the federal action is to respond to Pacific Soda's proposed Mine Plan (Appendix C)² and ROW applications to construct and operate trona mining facilities, including mine well fields, processing facilities, a co-generation plant, storage ponds, transportation facilities, and utility features. If approved by the BLM, this would allow Pacific Soda the opportunity to develop their valid existing leases on specific public lands within the proposed mine permit boundary as authorized by the MLA of 1920 (as amended) and the FLPMA. Pacific Soda would construct the mining facilities and transportation and utility features specified in the Mine Plan and SF-299 applications for ROWs for linear infrastructure. The objective of Pacific Soda would be to use these facilities and employ solution mining technologies to mine trona beds 2,300 feet below the surface and produce an estimated 6.0 million MTs of marketable soda ash per year.

The need for the federal action is established by the BLM's responsibility under the MLA of 1920 (as amended) and FLPMA. Under these statutes, the BLM is required to respond to the Project proposal and review the proposed Mine Plan and associated SF-299s to ensure that mining activities and construction of associated facilities are consistent with leasing stipulations and other requirements mandated in the

¹ Executive Order 14154, *Unleashing American Energy* (Jan. 20, 2025), and a Presidential Memorandum, *Ending Illegal Discrimination and Restoring Merit-Based Opportunity* (Jan. 21, 2025), require the Department to strictly adhere to the National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321 *et seq.* Further, such Order and Memorandum repeal Executive Orders 12898 (Feb. 11, 1994) and 14096 (Apr. 21, 2023). Because Executive Orders 12898 and 14096 have been repealed, complying with such Orders is a legal impossibility. The [bureau] verifies that it has complied with the requirements of NEPA, including the Department's regulations and procedures implementing NEPA at 43 C.F.R. Part 46 and Part 516 of the Departmental Manual, consistent with the President's January 2025 Order and Memorandum.

² The Mine Plan is referred to frequently throughout the EIS and is provided in Appendix C. The reference to Appendix C is provided here at first mention only.

Record of Decision and Rock Springs Resource Management Plan (BLM 2024c) (Rock Springs RMP) and the *Record of Decision and Approved Kemmerer Resource Management Plan* (BLM 2010a) (Kemmerer RMP),³ as well as other applicable federal, state, and local statutes and regulations. This includes reviewing proposed activities on USFS-administered lands for compliance with the *Ashley National Forest Land Management Plan* (USFS 2024b) (Ashley LMP).⁴ NEPA also mandates that the BLM evaluate or analyze the impacts of the Proposed Action and develop alternatives and mitigation, when necessary, to address potential impacts to resource values and other resource uses.

1.4 Decisions to be Made

Following a thorough NEPA analysis, the BLM's decision includes whether to approve the proposed Mine Plan and SF-299 applications (for transportation and utility features) and, if approved, to determine whether modifications and/or additional mitigation measures are required to conform to leasing stipulations specified in the BLM Kemmerer and Rock Springs RMPs, as well as to meet the established requirements identified in the applicable regulations. In addition, the BLM's decision includes whether to approve the SF-299 applications (for transportation and utility features) in accordance with FLPMA, the MLA, and applicable BLM regulations and policies. Any selected alternative involving USFS-administered lands would require a separate decision issued by that agency as well as conformance to the Ashley LMP.

1.5 Resource Management Plan Conformance

Resource management planning regulations mandate that all actions approved or authorized by the BLM be reviewed for conformance with existing land use plans (43 CFR 1610.5-3). A proposed action and alternatives must either be consistent with applicable land use plans and clearly in agreement with the terms, conditions, and decisions of the approved plans, or a plan amendment must be completed in order for the Proposed Action to be approved.

The Proposed Action is in conformance with the BLM Rock Springs RMP and the Kemmerer RMP, as amended by the *Bureau of Land Management Casper, Kemmerer, Newcastle, Pinedale, Rawlins, and Rock Springs Field Offices Approved Resource Management Plan Amendment (ARMPA) for Greater Sage-Grouse* (BLM 2015) (2015 ARMPA). The Rock Springs RMP, the Kemmerer RMP, and the 2015 ARMPA identify the proposed Project area as open for development of sodium (trona) resources and the Project area is not allocated as an exclusion area for ROWs. The relevant management decisions are included on pages 2 to 27 of the Kemmerer RMP (BLM 2010a), page 2-20 of the Rock Springs RMP (BLM 2024c), and page 57 of the 2015 ARMPA (BLM 2015). All development would comply with land use restrictions, best management practices (BMPs), and other requirements detailed in the RMPs and amendments.

The portion of the proposal on USFS lands must comply with the Ashley LMP or a plan amendment would need to be completed for the relevant activities to be approved. The USFS portion of this proposal falls in an existing utility corridor in the Flaming Gorge National Recreation Area (NRA) and because the proposed pipeline would be buried, appears to be in conformance with plan direction for this area.

³ The Rock Springs RMP and Kemmerer RMP are referred to frequently throughout the EIS; therefore, the author-date citation is provided here at first mention only.

⁴ The Ashley LMP is referred to frequently throughout the EIS; therefore, the author-date citation is provided here at first mention only.

1.6 Applicable Laws, Statutes, and Regulations

The BLM is responsible for managing valid existing mineral leases on public lands as authorized by the MLA of 1920, as amended. The MLA of 1920 provides for the leasing of deposits of coal, phosphate, sodium, potassium, oil, oil shale, native asphalt, solid and semisolid bitumen, bituminous rock or gas, and lands containing such deposits owned by the United States.

Owners of mineral leases are entitled to reasonable access to explore for and develop those leases on public domain lands. To use public lands administered by the BLM for leasable mineral exploration and development, Pacific Soda must comply with the FLPMA, BLM Kemmerer and Rock Springs RMPs, and other applicable statutes.

Mining operations on BLM-administered lands must be conducted in accordance with an approved mine plan. When a proposed mine plan is complete and deemed ready for environmental analysis, the BLM initiates a review under NEPA. Numerous measures to reduce impacts on the surrounding environment are typically described in a proposed mine plan. Specific stipulations and/or mitigating measures may be developed during the NEPA process, typically when the NEPA analysis is nearing completion and a preferred alternative has been identified. Once the BLM and operator can be reasonably certain of how future mining activities, if approved, would be conducted, mitigating measures to the operator's proposed mine plan are then included as conditions of approval in the BLM decision document.

Under NEPA requirements, the BLM must also coordinate with other federal, state, and local agencies whose responsibilities may include some aspects of a proposed action. As the lead federal agency under NEPA, the BLM initiates coordination with other agencies, including consultation with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act (ESA), consultation with the State Historic Preservation Office (SHPO) under the National Historic Preservation Act (NHPA), and compliance with the Clean Water Act (CWA), Federal Water Pollution Control Act, Clean Air Act (CAA), Solid Waste Disposal Act, and the Wyoming Source Water Assessment and Protection Program administered by the Wyoming Department of Environmental Quality (DEQ), Water Quality Division.

All laws, statutes, and regulations that are relevant to the Proposed Action are briefly described in Appendix A.

1.7 Cooperating Agencies

The Department's NEPA regulations allow the lead agency to invite other federal, state, Tribal, or local agencies to serve as cooperating agencies in preparing the EIS (43 CFR 46.155, 46.230, and 46.220). A cooperating agency must hold legal jurisdiction over the resources that could be impacted by the Project or provide special expertise with respect to resource issues addressed by the NEPA analysis.

Based on previous NEPA analyses related to mining activities in the KFO and Rock Springs Field Office (RSFO), the BLM invited federal, state, and local agencies with jurisdiction or special expertise related to the Proposed Action, as well as Native American Tribes with potential interest in the Project. The agencies invited to be cooperating agencies are listed in Table 1.7-1.

Table 1.7-1. Agencies Invited to be Cooperating Agencies

Jurisdiction	Agency
Federal	USFS
	U.S. Environmental Protection Agency
	National Park Service
State	Wyoming Department of Agriculture
	Wyoming DEQ
	Wyoming Game and Fish Department
	Wyoming Governor's Office
	Wyoming Office of Outdoor Recreation
	Wyoming Office of State Lands and Investments
	Wyoming State Engineer's Office
	Wyoming SHPO
County/Local	Wyoming State Parks, Historic Sites, and Trails
	Lincoln County Commissioners
	Lincoln County Conservation District
	Sweetwater County Commissioners
	Sweetwater County Conservation District
	Uinta County Commissioners
	Uinta County Conservation District
	City of Green River
	Town of Granger
Tribal	Coalition of Local Governments
	Northern Arapaho Tribe
	Ute Tribe of the Uintah and Ouray Reservation
	Eastern Shoshone Tribe of the Wind River Reservation
	Shoshone-Bannock Tribes of the Fort Hall Reservation

Cooperating agency participation includes review of analyses, contribution of technical expertise, and assisting in the response to public comments as required by their jurisdiction or regulatory authority. Memoranda of understanding (MOUs) were developed between the cooperating agencies and the BLM to formalize the relationship and provide a framework for cooperation and coordination to successfully complete the EIS in a timely, efficient, and thorough manner and to describe the respective roles, responsibilities, and expertise of each entity in the NEPA process. The following agencies have agreed to formally participate in this EIS process through an MOU:

- Lincoln County Commissioners
- Lincoln County Conservation District
- Sweetwater County Commissioners
- Sweetwater County Conservation District
- Uinta County Commissioners

- Uinta County Conservation District
- City of Green River
- Town of Granger

Additional details on coordination and consultation with these groups and agencies are provided in Chapter 4 of this Final EIS.

1.8 Scoping

Scoping is one of the first steps and an integral part of the NEPA process. The primary purpose of scoping is to determine the scope of issues to be addressed in the NEPA analysis and to identify potentially significant issues related to the Proposed Action (43 CFR 46.435).

The scoping process involves both internal and external scoping. Internal scoping is conducted by the BLM to determine preliminary issues and concerns related to the Proposed Action. External scoping provides an opportunity for members of the public to be involved in the NEPA process. The objective of the public scoping process is to inform the public regarding the proposed Project and to solicit input regarding the issues that should be analyzed and the alternatives that should be considered to address those issues. This enables the BLM to expand on the preliminary issues and ensure that they address public concerns regarding the proposed Project.

A notice of intent (NOI) was published in the *Federal Register* and posted on the BLM's E-Planning website (<https://eplanning.blm.gov/eplanning-ui/project/2016395/510>) on April 28, 2022, which initiated the official public scoping period that concluded on June 17, 2022. The notice invited the public to participate in the scoping process and requested comments on issues related to the proposed Project. An online, virtual public scoping meeting was conducted on June 2, 2022. The USFS also made the scoping documents available on their website (<https://www.fs.usda.gov/project/ashley/?project=59259>) and notified their online subscribers of the scoping period.

1.8.1 Issues Identified During Scoping

For the purpose of the BLM NEPA analysis, an issue is a point of disagreement, debate, or dispute with a proposed action based on some anticipated environmental effect. An issue is more than just a position statement, such as disagreement with grazing on public lands. Issues point to specific environmental concerns and can help shape the proposed action, develop alternatives, and guide the analysis. An issue has a cause-and-effect relationship with the proposed action or alternatives; is within the scope of the analysis; has not been decided by law, regulation, or previous decision; and is amenable to scientific analysis rather than conjecture.

Table 1.8-1 presents the primary issues identified for detailed analysis during agency (internal) and public (external) scoping. The issues were grouped by theme and categorized by resource. Additional details regarding the public scoping process, scoping comments received, and issues identified during scoping are available in the Scoping Report (Appendix B).

Table 1.8-1. Issues Analyzed in Detail

Resource Topic	Issues Analyzed in Detail
Air quality and greenhouse gas emissions	- Contributions to ambient air concentrations of criteria pollutants, ozone precursors, and hazardous air pollutants - Potential effects to Air Quality Related Values at Class I areas - Increases in greenhouse gas emissions that may cause or contribute to cumulative climate change impacts
Soils	- Soil loss and potential effects on topsoil viability from increased soil erosion - Potential impacts to microbial communities and soil crusts, prime and unique agricultural lands, and long-term soil chemistry
Water resources	- Potential impacts to surface water and groundwater systems and drainage patterns - Information regarding groundwater interconnectivity with surface water
Geology and mineral resources	Geological stability and removal of mineral resources
Cultural resources	Direct physical disturbance to cultural sites and indirect impacts to cultural setting from visual intrusions caused by Project facilities
Paleontological resources	- Direct physical disturbance to known and unknown paleontological resources - Potential effects on access to unknown paleontological resources due to placement of Project facilities
Vegetation resources	- Potential impacts on native plant communities and sensitive plant species and associated suitable habitat - Increases in the introduction and spread of invasive species and noxious weeds. - Potential impacts to vegetation trends and potential
Wetlands	- Disturbance to surface hydrology, soils, and vegetation that could affect the quality, quantity, and function of wetlands - Potential impacts to riparian areas associated with wetlands
Fisheries and aquatic resources	- Potential impacts on aquatic habitat, threatened and endangered species, and BLM species of concern from direct disturbance and water diversion on the Green River - The potential for the water diversion structure to cause fish entrapment or issues for fish passage
Wildlife resources	- Potential impacts to special status, sensitive, and non-sensitive species - Potential impacts on migratory birds from brine storage ponds, and identification of related protection measures - Potential for rail line to affect wildlife movement/migration
Greater Sage-Grouse	- Potential for increased mortality due to direct impacts on Greater Sage-Grouse populations - Potential for loss, fragmentation, and degradation of habitat
Livestock grazing	- Potential impacts to forage levels and overall rangeland capacity within livestock grazing allotments and pastures - Potential for vehicle and train collisions with livestock - Livestock access within the Project area
Health and human safety/hazardous materials	Increased potential for impacts to human health and safety from solid and hazardous waste management activities
Lands and realty	Potential impacts on BLM land tenure decisions, existing and reasonably foreseeable future ROWs, designated corridors, and easements
Recreation	Degradation or elimination of dispersed and motorized recreation opportunities and experiences
Socioeconomics	- Impacts on jobs, general revenue, and tax revenue from Project construction and operations - Identification of and potential impacts to minority, low-income, and indigenous communities within the impact analysis area
Travel and transportation	Effects on public access, the ability to use motorized modes of travel, traffic levels on public roadways, and maintenance needs for public roadways
Visual resources	Visual intrusions that have the potential to affect scenic quality and landscape character
Fire and fuels	- Changes to fuel characteristics and related impacts on fire behavior - Increased ignition sources that could increase fire occurrence - Potential effects on fire suppression activities

1.8.2 Issues Considered but Eliminated from Detailed Analysis

The issues the BLM has identified as not requiring detailed analysis in this Final EIS, as well as the rationale for dismissal from detailed analysis, are provided in Table 1.8-2.

Table 1.8-2. Issues Dismissed from Detailed Analysis

Resource Issue	Rationale for Dismissal from Detailed Analysis
Wild horses: Potential impacts to wild horses in the White Mountain Herd Management Area	The Project footprint associated with the Proposed Action and alternatives do not intersect the White Mountain Wild Horse Herd Management Area or any wild horse herd management areas in the RSFO. Therefore, neither the Proposed Action nor the alternatives would create disturbances to wild horse herds, affect vegetation that provides forage for wild horses, or impact water sources used by wild horses. As a result, impacts to wild horses would not occur.
Hazardous materials: Potential for the generation, concentration, and relocation of radioactive material	Radioactive material (beyond natural background levels) is not present in the Project area, and neither the Proposed Action nor the alternatives include actions that would result in the generation, concentration, or relocation of radioactive material. Therefore, it has been determined that impacts associated with radioactive material would not occur.

CHAPTER 2. PROPOSED ACTION AND ALTERNATIVES

2.1 Introduction

This chapter summarizes the Proposed Action and alternatives for the proposed Project. Alternative A is the No Action Alternative. Alternative B is the Proposed Action as described in the Mine Plan that was submitted to the BLM in February 2022 (Appendix C) and in associated ROW applications. Other alternatives considered for detailed analysis in this EIS include Alternative C and Alternative D, as described in Sections 2.2.3 and 2.2.4, respectively. All alternatives presented in this chapter were developed based on agency and public scoping input and supporting technical information provided by Pacific Soda. After considerable deliberation, the BLM selected Alternative D as the Agency's Preferred Alternative. This chapter also includes a summary of alternatives that were considered but eliminated from detailed analysis (Section 2.3) and a comparative summary of environmental impacts (Section 2.5).

2.2 Proposed Action and Alternatives

2.2.1 Alternative A (No Action)

Under the No Action Alternative, the Mine Plan as currently proposed would not be approved, and the proposal would be rejected by the BLM. If the proposal is rejected by the BLM, resource impacts would not occur.

Under the applicable regulations for trona operations at 43 CFR Subpart 3592, mining plans must be consistent with and responsive to the requirements of the lease, license or permit for the protection of nonmineral resources and for the reclamation of the surface of the lands affected by the operations and meet all established requirements. Therefore, a circumstance under which the BLM might select the No Action Alternative (or elements from the No Action Alternative) could be a finding by the BLM that the Mine Plan does not meet the applicable and established requirements, and/or that a circumstance under 43 CFR 2804.26 (or 43 CFR 2884.23 for the MLA ROW) would apply to one or more of the ROWs, as submitted. Under Departmental NEPA regulations (43 CFR 46.415(b)), the No Action Alternative also serves to provide a baseline for comparing anticipated impacts of the action alternatives and thus helps to better inform the BLM decision-maker with an estimate of the impacts of denying the proposed Mine Plan.

2.2.2 Alternative B (Proposed Action)

2.2.2.1 *Proposed Project Components*

The following sections summarize key components of Alternative B, the Proposed Action, which are detailed in the Mine Plan (Appendix C) and in ROW applications. Under the Proposed Action, Pacific Soda would construct mining facilities and employ solution mining technologies to mine four of the deepest known trona beds 2,300 feet below the surface in Sweetwater County, Wyoming. The proposed Project area is south of I 80 and west of WY 530, near the City of Green River, Wyoming (Appendix Q, Figures 2.2-1 and 2.2-2). Proposed Project facilities include processing facilities, comprising a solution mining pump station, a refinery, a co-generation facility, storage and surge ponds, and a landfill. Utility infrastructure includes a water supply pipeline, overhead transmission line, and natural gas pipeline. Transportation infrastructure includes a rail line, one existing access road, and one constructed access road. The processing facilities are proposed for location in Sections 22 and 27, T16N, R110W. The mine well field would be in Sections 23 to 26 and 35, T16N, R110W. Initial construction would occur over a 4-

year period, followed by 23 years of operations and 7 years of decommissioning/reclamation. The total timespan of the Project from initiation of construction activities to completion of final reclamation would be 34 years.

The proposal for the Proposed Action was submitted by Pacific Soda in April 2020. Pacific Soda submitted an SF-299 application to the BLM on November 5, 2020, for the Project-related transportation and utility features, including a water supply pipeline, rail line, access road, and overhead transmission line. Pacific Soda submitted a second SF-299 application to the BLM on December 21, 2020, for a natural gas pipeline. These infrastructure features are proposed to cross a combination of private lands and USFS- and BLM-administered lands in T16 to 19N and R107 to 111W, 6th Principal Meridian. The SF-299 applications are considered to be part of the Proposed Action, and the impacts resulting from the associated linear features are analyzed in this Final EIS.

Pacific Soda estimates that approximately 23.5 million MTs of trona are in reserve on each section of land. Mining would occur on each section for 9 to 10 years, and mined trona would be refined to produce approximately 6.0 million MT of marketable soda ash and 440,900 MTs of sodium bicarbonate (baking soda) per year. The proposed Project (including all facilities, mining infrastructure, and ancillary and attendant features) would collectively disturb a total of approximately 6,325 acres, of which approximately 3,369 acres would be on private land, 2,947 acres would be on BLM-administered lands, and 9 acres would be on land administered by the USFS, all within Sweetwater County, Wyoming.

Processing Facilities

The mine processing facilities would be within Sections 22 and 27 and would consist of two plants (each containing a solution mining pump station area and refinery), a co-generation facility, two storage ponds, one surge pond, and a landfill.

Solution Mining Pump Station Area

The solution mining pump station area in each plant would control solutions transported to and from the mine well field. Each pump station area would have a total of seven pump units (four in operation and three in reserve) and six storage tanks (four for brine solution and two for well injection supply). Injection fluids would be pumped from a well injection tank to the mine well field for use in the solution mining process. Brine fluid would be pumped from the mine well field to the pump station area and stored in a brine tank prior to processing. The high pressures and temperatures of the solutions transported to and from the mine well field would prevent freezing in the winter months. The water intake will be powered by an electrical distribution line from the proposed co-generation facility.

Refinery

The refinery process includes the following steps: filtering, pre-concentration, crystallization, drying, storage, and packaging. The brine solution pumped from the mine well field undergoes a two-step filtration process: 1) suspended solids are removed using a sand filter, and 2) fine impurities are removed using cartridge filters. Once filtered, the solution is pumped to the pre-concentrating section of the refineries for the stripping and evaporation processes. The stripping and evaporation processes remove water from the solution, concentrating the brine from a 15% to 16% solution to a 30% solution. The concentrated brine is then pumped to the crystallization unit of the refinery where centrifuges separate the liquid and solids from the slurry to create a “cake.” The cake contains crystals with 2% to 3% moisture, which are routed to the fluid bed dryer that uses seven steam-heated bundles to completely dry the cake and two cooling bundles to lower the temperature of the cake. Once the product dries and cools, it is screened and stored until it is loaded into enclosed rail cars or packaged into bags.

Co-generation Facility

The co-generation facility would serve both plants to produce the steam necessary for the processing equipment and the electricity used in plant operations. The facility would consist of a combination of combustion turbines, heat recovery steam generators (HRSGs), and steam turbine generators. Five 60-megawatt (MW) combustion turbine units would be used to generate 240 MW per hour of electricity and to supply exhaust to the HRSG units. Four or five units would be online at a time, allowing one unit to remain on standby. Water would combine with the exhaust in the HRSG to generate the steam needed for plant operations.

The steam generated from the HRSGs would route to a steam turbine to generate additional electricity and produce two separate streams of steam (one at 190 pounds per square inch [psi] and the other at 30 psi) for use in the refinery process. The co-generation facility and steam turbine generators would produce 100% of the required electricity for Project operations. However, if necessary, electricity from the overhead transmission lines can be used.

Storage and Surge Ponds

Storage ponds would be constructed to store brine solution until the desired concentration of brine solution produced by the wells is reached (approximately 3–4 months from the start of well operation). Once this occurs, the storage ponds would store salts generated from the refining process, as well as solids from the evaporator. The total storage ponds area would be approximately 300 acres. The storage ponds would be fenced and equipped with a liner and leak detection system.

A surge pond would be constructed to provide backup water storage for mining operations. The surge pond would be approximately 2 acres, store up to 3.4 acre-feet of water, and would be equipped with a liner for leak protection.

Landfill

The Proposed Action includes a landfill to dispose of solid waste materials generated during mining operations (excluding hazardous wastes). The landfill site would consist of a 33-acre lined industrial landfill, a 2.5-acre leachate evaporation pond, a 3.9-acre unlined construction/demolition and inert waste landfill, and associated stormwater detention and conveyance structures. The landfill would have an engineered liner to prevent infiltration of leachate into the ground. Leachate would be removed from the landfill via a leachate collection system and managed on-site in a leachate evaporation pond. Pacific Soda would develop the landfill sequentially by constructing, filling, and capping small areas of the liner, known as landfill cells, to facilitate the orderly operation of the landfill and minimize leachate generation.

Utility Infrastructure

Water Supply Pipeline

A water pipeline would be constructed from a water diversion structure on the Green River to the mine processing facilities to provide the water needed for solution mining activities. The proposed pipeline consists of two individual pipes within a single trench to allow for redundancy and to minimize surface disturbance. The pipes would be up to 24 inches in diameter and constructed of steel, polyvinyl chloride, or high-density polyethylene and lined with cement mortar, or consist of a combination of these materials. The pipeline would cross beneath existing utilities, infrastructure, and the Blacks Fork River in accordance with applicable authorizations for the proposed Project. The water right obtained by Pacific Soda allows for a maximum annual use of 14,500 acre-feet of water.

The water intake structure (point of diversion) would be south of Scotts Bottom Road near the City of Green River, Wyoming. It would be outside a meander bend, as this position on a river typically provides a lower risk of scour and bank erosion. Design of the intake structure would consider measures to avoid unstable locations or locations prone to sedimentation.

Overhead Transmission Line

A 230-kilovolt (kV) overhead transmission line would provide the power necessary for Project construction, startup, and commissioning. The proposed transmission line would convey electricity from the existing Rocky Mountain Power substation north of I 80 to the co-generation facility, entering the site at the switchyard. The transmission line would be constructed using 120-foot-tall steel monopole structures set on foundations of reinforced concrete piers. The poles would be approximately 425 to 1,000 feet apart, depending on terrain.

Natural Gas Pipeline

A buried natural gas pipeline would be constructed by Kinder Morgan to provide natural gas to the processing facility for use in refinery and co-generation facility processes. The gas line would tie into an existing natural gas pipeline corridor containing the Northwest Pipeline (owned by Williams Company) and the Colorado Interstate Gas Pipeline (owned by Kinder Morgan). The pipeline would be 10 inches in diameter and include a flow-control valve, ultrasonic meter, and additional monitoring and measuring equipment to meter gas flows.

Transportation Infrastructure

Rail Line and Access Road

The rail line and access road would allow for transportation of mining product and personnel between the processing facility and the Union Pacific Railroad Evanston Subdivision Mainline. This transportation route would be composed of culvert, pipeline, and private road crossings; a grade-separated public road crossing at I 80; a crossing of the Blacks Fork River; and the construction of a rail siding area to allow for ingress, loading, egress of rail cars.

The access road would be constructed parallel to the rail line and would have one driving lane in each direction. The road would begin at a new intersection with Wyoming State Highway 374 (WY 374). To support additional vehicular traffic associated with the Project, modifications would be made at the intersection of the access road and WY 374 to facilitate a deceleration/right-turn lane for westbound traffic and a dedicated left-turn lane for eastbound traffic. The combined rail line and access road would maintain horizontal separation with a ditch separating the two. The rail line/access road corridor would cross I 80 at a perpendicular angle via paralleled overpass structures for both the rail line and access road. Table 2.2-1 lists the area and length of the key Project elements.

Pacific Soda is also requesting use of the existing access road that extends from WY 530 to the mine site area. Pacific Soda would use this road for primary access during construction of the mine site, including the mine well field. During Project operations, the access road would remain intact, but would only be used for emergency purposes. Roadway improvements previously completed to the access road are sufficient to accommodate anticipated equipment, and road upgrades/alterations are not proposed.

Table 2.2-1. Proposed Action Surface Disturbance Summary

Project Element	Construction Disturbance (acres)	Construction Disturbance (miles)
Mining facilities		
Mine permit boundary	4,981	N/A
Utility infrastructure		
Water supply pipeline	247	24.7
Transmission line	206	16.9
Natural gas pipeline	24	3.3
Transportation infrastructure		
Rail line and access road	1,022	20.9
Total	6,322*	65.8

Note: N/A = not applicable.

* Total acres are not the sum of the acres for the individual Project elements due to overlap of the utility infrastructure with the Project area.

2.2.2.2 *Proposed Project Activities*

Preconstruction

Prior to Project construction, Pacific Soda would develop key planning documents and complete required activities to facilitate construction and operations and ensure compliance with applicable laws, regulations, and policy.

Health and Safety

Pacific Soda would develop a safety program to maintain a safe work environment and ensure the safety of all personnel involved with the Project. The plans supporting the program include the following:

- **Health and Safety Procedure:** This would provide a description of the processes that staff and contractors are required to follow to provide a safe work environment. This is included in Appendix C of the Mine Plan and would be updated as final Project planning and staffing of employees and contractors for construction and operations are completed.
- **Blasting Plan:** This plan would provide the general guidance and standards (e.g., applicable regulations, storage and transport of materials, and public safety protocols) associated with blasting activities. Such a plan would be developed if Pacific Soda determines that blasting is necessary during Project construction.
- **Traffic Management Plan:** This plan would address access points to minimize hazards related to increased traffic resulting from Project construction and operations. The plan is included in Appendix D of the Mine Plan.

Environmental Compliance

Pacific Soda would implement actions and activities to protect the environment and comply with applicable local, state, and federal environmental permits and the BLM record of decision, ROW grant(s), and/or notices to proceed before and during construction activities.

Pacific Soda developed an Environmental Compliance and Inspection Plan, which is included in Appendix E of the Mine Plan. The Environmental Compliance and Inspection Plan would be

implemented throughout the life of the Project, with oversight by the BLM, Wyoming DEQ Land Quality Division (LQD), and a third-party compliance inspection contractor. The plan details proponent and contractor roles and responsibilities; the environmental training program; and monitoring, recordkeeping, and reporting requirements.

Preconstruction Activities

Prior to engaging in construction activities, Pacific Soda would provide the necessary notifications specified in the BLM RMPs, ROW grants, and/or notice to proceed; obtain requirement permits and approvals from federal, state, and local government agencies; and conduct preconstruction surveys and a preconstruction conference.

Preconstruction surveys are required to evaluate the potential for sensitive resources within potentially affected areas. Pacific Soda would flag avoidance zones for sensitive resources in the field as outlined in the flagging plan of the Mine Plan to facilitate construction worker awareness and implementation of avoidance measures. The flagging plan requires clear identification and marking of the centerline and exterior limits of ROWs, transportation routes, and public land parcels. Markers would also be used to limit access and prohibit activities within work and travel areas to ensure avoidance of cultural and environmentally sensitive areas. In addition, field monitors would be present during construction activities and would be responsible for reporting compliance with the terms and conditions of the BLM ROW grant and applicable permitting documents, as specified in the Environmental Compliance and Inspection Plan.

Construction

Various construction crews specializing in various construction components of the Project infrastructure would construct the Project. Pacific Soda would use contractors and subcontractors according to the equipment and personnel needs of the Project. Pacific Soda anticipates that much of the workforce would be from local communities within Wyoming; however, workers from other parts of the country may be necessary to perform specialized labor. The estimated number of employees (full- and part-time) used for construction is 3,091 on average and 5,247 at the peak of construction activities.

Clearing, grading, and other soil and vegetation disturbance would be limited to the extent practicable. Clearing would be necessary for new roads, pipelines, transmission line structure locations, and material storage, staging, and laydown areas. In some areas, clearing may be necessary to allow for movement of construction traffic, operation of construction machinery, and placement of excavated materials within the Project footprint during construction. In most cases, soil conditions (e.g., rutting, loose, sandy, and limited topsoil) would dictate whether the contractor would remove vegetation or leave it in place. Consistent with the Wyoming Pollution Elimination Discharge System Large Construction Stormwater General Permit requirements, erosion and sediment control BMPs specified in the Project Stormwater Pollution Prevention Plan (Appendix F of the Mine Plan) would be implemented in areas where ground disturbance would leave the soil susceptible to wind and water erosion.

Grading would be used to create a suitable work surface for construction vehicles and construction of permanent Project features. The following general grading measures would be implemented, as appropriate, to minimize erosion during construction:

- Minimize the quantity and duration of soil exposure
- Protect exposed soils during construction to the extent practicable by reducing the velocity of water and redirecting runoff to an appropriate location

- Install and maintain erosion and sediment control BMPs during construction until final stabilization occurs
- Establish vegetation as soon as possible following facilities construction and final grading

Topsoil material suitable for reclamation (minimum of 6 inches) would be removed and stockpiled as part of clearing and grading activities. The Reclamation Plan (Appendix J of the Mine Plan) specifies topsoil stockpiling and segregation procedures.

Operations

Once the processing facility and other Project elements are constructed and production activities are initiated, the Project would move into the operations phase. Project operations would occur primarily during daylight hours, although the processing facility and mine well fields would operate 24 hours per day for most days of the year. Truck transport of materials from the processing facility to the rail loadout facility would operate primarily during daylight hours (two 8-hour shifts). The rail loadout facility would conduct operations day or night, depending on the timing of the material transport. The operations workforce would include an on-site facility manager, administrative support, earthwork transportation workers, and other operations personnel. It is estimated that 530 employees (full- and part-time) would be needed for operations.

Closure and Reclamation

The primary Project reclamation actions would include facility decommissioning, surface reclamation, and revegetation, with the objective of returning surface disturbances to conditions compatible with pre-mining uses. To the extent practicable, decommissioning and reclamation of each production area (mining unit) would begin within 6 months of mining completion and would be completed within 2 years after mining operations cease. This activity includes decommissioning and plugging wells following DEQ and BLM requirements, grading and recontouring as necessary, and revegetating the mine unit area. Final facility decommissioning and reclamation of mining-related surface disturbances and linear infrastructure would be completed within 2 years after mining in the last mine unit area. Figure 5-13 in the Mine Plan shows the estimated schedule of construction, operations, and decommissioning/reclamation activities.

Before final reclamation, aboveground improvements, buildings, processing equipment, and other structures and equipment would be removed. The surface would be reclaimed to preconstruction conditions. To the extent possible, the gravel/ballast from the rail line and roadbeds would be removed, and grading and contouring would be conducted to blend with the natural topography. Soils would be decompacted before seeding with the approved permanent seed mixture.

After liquids in the brine ponds evaporate, Pacific Soda would remove and transport precipitated solids to the processing facility for processing into product. The brine and surge pond liners would then be disposed of at an approved disposal facility. The disturbed areas would be filled in as necessary and graded to a natural contour before seeding.

2.2.2.3 *Water Use*

The Project would use surface water from the Green River via a water diversion/intake structure. Pacific Soda estimates that up to 4,796 gallons per minute (12.8 cubic feet per second [cfs]) would be necessary, 24 hours a day and 7 days a week, during operations. The water right obtained by Pacific Soda allows for a maximum annual use of 14,500 acre-feet of water and is subject to both intrastate Wyoming Water Law and all parts of interstate laws, including the Colorado River Compact. In the event of regulation or

curtailment, Pacific Soda would work with the Wyoming State Engineer's Office to comply with regulatory requirements that may require operations to cease during periods of water shortages.

Water from the Green River would be used for the following purposes:

- Steam production
- Injection solution
- Cooling medium during heating processes
- System purge
- Dissolving sodium carbonate decahydrate crystals
- Fire suppression
- Potable uses (i.e., drinking water)
- Sanitary uses (e.g., toilet flushing, showers)
- Dust suppression in the mine well field
- Landscaping

2.2.2.4 Hazardous Materials and Solid Waste

As described in Appendix L of the Mine Plan, solid wastes associated with the solution mining and sodium carbonate processing activities would typically be nonhazardous and would generally consist of regular trash, water treatment sand filter media, cartridge filter elements, column internals (demisters, packing), baghouse filters, overburnt/unburnt calcium carbonate, sludge/sediment from storage and surge ponds, and miscellaneous debris that would be disposed of in the on-site landfill. Any toxic or hazardous wastes generated from mining operations, such as used oil, truck shop waste (e.g., air filters, tires), causticizer scaling (calcium carbonate, magnesium carbonate, and sodium carbonate cleaned with acid), and used electrical equipment would be disposed of at an approved off-site facility. Permitting of the on-site solid waste landfill, in conjunction with proper on-site storage and off-site transportation and disposal of toxic and/or hazardous wastes at approved facilities, would minimize impacts to human health and safety from these materials.

2.2.2.5 Applicant-Committed Design Features and Required Bureau of Land Management and U.S. Forest Service Stipulations

Pacific Soda commits to minimizing environmental effects during construction, operations, and reclamation of the proposed Project through implementation of Applicant-committed design features, which are shown in Section 7.17 of the Mine Plan (Appendix C, Table 7-6). In addition to these design features, other required management, BMPs, standard operating procedures, required design features, and mitigation guidelines included in the Kemmerer RMP, Rock Springs RMP, and the Ashley LMP would also apply to the proposed Project (Appendix D). The analysis of environmental consequences presented in Chapter 3 assumes these measures would be applied to the proposed Project.

2.2.3 Alternative C

All Project elements described under Alternative B would be included under Alternative C, except the overhead transmission line would be constructed along I 80 and extend south to be collocated with the rail line (Appendix Q, Figure 2.2-3). The other difference from Alternative B is that the access road would

use an existing interchange on I 80 (Exit 61) and run along I 80 before turning south to be collocated with the rail line. These changes would collocate the transmission line, access road, and rail line and thereby reduce construction through undisturbed areas. This change would also eliminate the need to construct road improvements (widening and intersection) at the intersection of WY 374 and the new access road.

The total surface disturbance would be approximately 6,387 acres, of which approximately 3,395 acres would be on private land, 9 acres would be on USFS lands, and the remaining 2,987 acres would be on BLM-administered lands.

2.2.4 Alternative D (Preferred Alternative)

Implementation of Alternative D would result in a larger Project footprint as compared to the Proposed Action (Alternative B) and Alternative C. The total surface disturbance would be approximately 7,015 acres, of which approximately 3,593 acres would be on private land, 3,329 acres would be on BLM-administered lands, and the remaining 93 acres would be on lands administered by the State of Wyoming. USFS-administered lands would not be intersected by the Alternative D footprint.

Substantial changes to the Project elements described under Alternative B are proposed under Alternative D (Appendix Q, Figures 2.2-4, 2.2-5, and 2.2-6). Although development of the mine well field and mine production levels would be unchanged, the following facilities would be moved from the mine site area to an area north of I 80, approximately 8 miles west of Green River, Wyoming, within a designated processing facilities boundary:

- Refinery
- Co-generation facility
- Emergency purge pond
- Topsoil stockpile
- Landfill
- Stormwater pond
- Rail loadout
- Water supply pipeline
- Rail loop track
- Natural gas pipeline
- Processing facility transmission line

The following facilities would remain adjacent to the mine well field but would be reconfigured across Sections 22 and 27 (Appendix Q, Figure 2.2-5):

- Solution mining pump station area
- Low total alkalinity pond
- Stormwater pond
- Septic tank and drain field
- Landfill
- Topsoil stockpile
- Surge pond

While all of Section 27 is part of the acreage totals for Alternative D, only a small part of Section 27 would be developed. Although the presence of people and the use of vehicles may occur across Section 27, proposed surface disturbance would be limited to the northern portion (Appendix Q, Figure 2.2-5).

In addition to the facilities listed above that would be moved from the mine site area to north of I 80, several additional facilities would be constructed or realigned under Alternative D. Below are descriptions of these Project elements.

2.2.4.1 *Brine and Condensate Pipelines*

Pacific Soda would construct two parallel, 36-inch-diameter pipelines, approximately 24.3 miles long and made of carbon steel (Appendix Q, Figure 2.2-4). One pipeline would carry heated water (condensate) from the processing facilities to the mine well field for injection, and one pipeline would carry a dissolved trona-in-water solution (brine) from the mine well fields to the processing facilities. The brine and condensate pipelines would be collocated within the same ROW but with two separate trenches. The pipelines would cross beneath existing utilities, infrastructure, and the Blacks Fork River.

2.2.4.2 *Mine Site Transmission Line*

Pacific Soda would construct an overhead, 23-mile-long, 69-kV mine site transmission line to transport electricity from the co-generation facility to the mine site (Appendix Q, Figure 2.2-4). The mine site transmission line would exit the south side of the co-generation facility and would mostly parallel the brine/condensate pipelines and mine site access road to the mine site.

2.2.4.3 *Mine Site Access Road*

Pacific Soda would construct an approximately 13.1-mile-long paved access road to the mine site from the existing Tenneco Road (Appendix Q, Figure 2.2-4). The access road would largely parallel the brine/condensate pipelines and mine site transmission line to the mine site.

Pacific Soda is also requesting use of the existing access road that extends from WY 530 to the mine site area. Pacific Soda would use this road for primary access during construction of the mine site, including the mine well field. During Project operations, the access road would remain intact, but would only be used for emergency purposes. Roadway improvements previously completed to the access road are sufficient to accommodate anticipated equipment, and road upgrades/alterations are not proposed.

2.2.4.4 *Processing Facilities Access Road*

Pacific Soda would construct a 2-mile-long paved access road from Wyoming State Highway 372 (WY 372) to the processing facilities (Appendix Q, Figure 2.2-6). The access road would largely parallel the processing facilities' water supply pipeline and natural gas pipeline.

2.2.4.5 *Water Intake and Pump Facility*

The water intake (point of diversion) would be northeast of the processing facilities (Appendix Q, Figure 2.2-6). It would be outside a meander bend; this position on a river typically provides a lower risk of scour and bank erosion. Detailed design of the water intake would consider measures to avoid unstable locations or locations prone to sedimentation. Pacific Soda would place the inlet within a geological bed formation to help provide a stable intake structure. The water intake would be powered by an electrical distribution line from the co-generation facility.

A pump facility would be constructed near the water intake. The facility would include pumps to draw water from the Green River and pump via the water supply pipeline to the processing facilities. The pump facility would include 0.85 acre of new disturbance for construction and operations. The pump facility would be powered by a buried 13.2-kV transmission line originating at the co-generation facility. This transmission line would parallel the water supply pipeline with an overlapping ROW and would be located a minimum of 100 feet apart.

2.2.4.6 *Water Supply Pipeline*

Pacific Soda would construct and operate a water supply pipeline to provide water from the Green River for solution mining and processing activities (Appendix Q, Figure 2.2-6). Pacific Soda anticipates that the water supply pipeline would be up to 24 inches in diameter, 6.4 miles in length, and constructed of carbon steel. The water supply pipeline would connect the processing facilities to the water intake, which is located on the Green River. Pacific Soda would construct the water supply pipeline using standard open-trenching procedures (i.e., excavate a trench, install the pipe within the trench, backfill the trench, and reclaim).

2.2.4.7 *Water Intake Access Road*

Pacific Soda would use an existing, graveled access road, approximately 2.2 miles long, extending east from WY 372 to the pump facility and water intake (Appendix Q, Figure 2.2-6). The existing water intake access road would require minimal improvements for Project use and would permanently establish a 20-foot-wide travel lane with additional shoulders and a drainage ditch within a 40-foot-wide permanent ROW. The last approximately 75 feet of the water intake access road to the pump facility would require the construction of a new road, which would be similar to the improved existing access road.

2.2.4.8 *Processing Facilities Natural Gas Pipeline*

A 2.2-mile-long buried natural gas pipeline would be constructed from the processing facilities to the existing Williams main line near WY 372 (Appendix Q, Figure 2.2-6). The tie-in would transfer natural gas to the processing facilities for use in the co-generation facility and refinery processes. The natural gas pipeline would generally follow the processing facilities access road and connect to the north side of the processing facilities.

2.2.4.9 *Processing Facilities Transmission Line*

Approximately 150 MW of power would be required for early production from the processing facilities before the co-generation facility becomes operational and during routine maintenance of the turbines. Pacific Soda proposes a new 230-kV line from the co-generation substation to an existing Rocky Mountain Power 230-kV transmission line north of the processing facilities in the southwest corner of Section 5, T18N, R108W (Appendix Q, Figure 2.2-6). The processing facilities' transmission line would enter the site and tie into the west side of the co-generation facility. The transmission line would be designed according to Rocky Mountain Power's requirements.

2.3 Alternatives Considered but Eliminated from Detailed Analysis

Departmental regulations mandate that alternatives that do not meet specific criteria be eliminated from detailed analysis (43 CFR 46.420). The criteria for eliminating these alternatives are described under Section 6.6.3 of the BLM NEPA Handbook (H-1790-1).

Several alternatives to the Proposed Action were suggested by the BLM, cooperating agencies, and the public during the internal and external scoping efforts. Some of these suggested alternatives were incorporated into Alternatives C and D, as described above. However, for some of the suggested alternatives, BLM determined that they should not be considered for detailed analysis for one or more of the following reasons:

- Not responsive to the purpose and need
- Technically or economically infeasible
- Inconsistent with policy objectives
- Speculative
- Substantially similar in design to another alternative
- Substantially similar or would have more effects than another alternative

A summary of the alternatives considered but not analyzed in detail with accompanying rationale is provided below.

- **Use conventional underground mining technology.** The suggested alternative was to construct a conventional underground mine instead of using solution mining technology. The purpose of this alternative was to reduce surface impacts to vegetation, soils, wildlife, visual, and other resources. This alternative was dismissed from detailed analysis because it does not meet the purpose of and need for the proposed Project, as the purpose and need specifies using solution mining technology to extract trona resources. Additionally, it was determined to be technically and economically infeasible for Pacific Soda to construct a conventional underground mine. Sufficiently shallow and sufficiently thick trona deposits thin or pinch out further south in the KSLA, making conventional, mechanical mining less or even uneconomic than those found in the northern portion of the KSLA.
- **Use existing facility for processing.** The suggested alternative was to pipe the post-extraction trona solution to the existing Sisecam facility for processing instead of constructing a new mine processing facility. The purpose of this alternative was to reduce overall surface disturbance and impacts to multiple resources. This alternative was dismissed from detailed analysis because it does not meet the Applicant's need and because achieving such an agreement with Sisecam is not possible.
- **Generate power via a coal-fired generator.** The suggested alternative was to construct a coal-fired generator and use local coal to generate power needed for mining activities instead of constructing the transmission line. The purpose of this alternative was to eliminate the need for constructing the transmission line and thereby reducing the extent of the Project footprint and reducing potential impacts to visual, wildlife, and other resources. This alternative was dismissed from detailed analysis because it is not technically or economically feasible to construct and permit a coal-fired facility and establish the needed coal supply chain.
- **Enclose storage ponds.** The suggested alternative was to cover the storage ponds instead of maintaining open ponds. The purpose of this alternative was to reduce potential impacts to waterfowl that might otherwise land in the highly saline storage ponds. This alternative was dismissed from detailed analysis because it is not technically feasible, as the ponds would be too large to be covered or enclosed.
- **Use groundwater wells for all water supply.** The suggested alternative was to drill groundwater wells to supply all water needed for the Project instead of diverting water from the Green River. The purpose of this alternative was to reduce impacts to water quantity in the Green River and

related impacts to aquatic species. This alternative was dismissed from detailed analysis because it is not technically feasible. Based on groundwater studies and modeling, the groundwater resources are not adequate to support the full operational needs associated with solution mining.

- **Generate power using solar energy technology.** The suggested alternative was to construct solar panel arrays to generate the power needed for mining activities instead of constructing the transmission line. The purpose of this alternative was to eliminate the need for constructing the transmission line, thereby reducing the extent of the Project footprint and reducing potential impacts to visual, wildlife, and other resources. This alternative was dismissed from detailed analysis because it is not technically feasible, as solar facilities in this area would not produce adequate power for the proposed Project. This alternative was dismissed from detailed analysis because it is not technically and economically feasible, as solar facilities of sufficient capacity in this area to produce adequate power for the proposed Project would require large land areas (approximately 7–10 acres per MW capacity) and sufficient storage capacity to provide a continuous supply of power to the proposed facilities. This would be impractical and result in adverse effects that would be avoided through the use of energy sources already available (such as natural gas supplies that would be transported to the Project through the proposed natural gas pipeline and existing electrical generation that would be transported to the Project through the proposed overhead transmission line).
- **Divert water from other sources.** The suggested alternative was to divert water from the Flaming Gorge Reservoir, Fontenelle Reservoir, or Blacks Fork tributary instead of using water directly from the Green River. The purpose of this alternative was to reduce impacts to water quantity in the Green River and related impacts to aquatic species. This alternative was dismissed from detailed analysis because it would result in substantially similar impacts as the Proposed Action (i.e., the suggested alternative would not reduce impacts). Because the Green River, Blacks Fork, Flaming Gorge Reservoir, and Fontenelle Reservoir are all part of the Colorado River Upper Basin, this alternative would not reduce impacts to aquatic species.
- **Transport water from a local municipality.** The suggested alternative was to transport water from a local municipality or industrial wholesaler instead of using water from the Green River. The purpose of this alternative was to reduce impacts to water quantity in the Green River and related impacts to aquatic species. This alternative was dismissed from detailed analysis because it is not technically feasible. Given the volume of water needed for solution mining, it would not be possible to obtain a sufficient, reliable water supply from a local municipality or industrial wholesaler.
- **Construct a wildlife overpass.** The suggested alternative was to construct a separate overpass or widen the overpass used for the access road or rail line to allow wildlife to cross over I 80. This alternative was dismissed from detailed analysis because it does not address impacts caused by the proposed Project and is not under the BLM's jurisdiction.
- **Use existing rail line.** The suggested alternative was to use the existing rail line that is operated by American Soda, which is a trona production company with mining facilities in the vicinity of the proposed Project. The purpose of this alternative was to eliminate the need to construct the new rail line and thereby reduce surface disturbance and related impacts to vegetation, soil, wildlife, and visual resources. This alternative was dismissed from detailed analysis because it would conflict with other mine permit requirements and bonding.

Sections 2.2.1 through 2.2.4 above represent the remaining practicable alternatives that arose from scoping for the proposed Mine Plan. This scoping included internal scoping with the BLM interdisciplinary team for the Project, consultation with Pacific Soda, ongoing discussions with the

cooperating agencies, and formal scoping outreach to the general public. See Section 1.8 and Chapter 4 for more details on this effort.

2.4 Comparative Features of Action Alternatives Analyzed in Detail

This section summarizes and compares the Project elements among Alternatives B, C, and D. The information in Table 2.4-1 can help the reader understand differences between the alternatives; however, the reader is urged to read the detailed alternatives and analyses to understand specific differences.

Table 2.4-1. Project Alternatives by Acres of Proposed New Disturbance

Disturbance Type	Alternative B (Proposed Action)	Alternative C	Alternative D (Preferred Alternative)
Total disturbance*	6,325 acres	6,387 acres	7,015 acres
Mine site	Area: 4,980.76 acres	Same as Alternative B	Area: 4,644.05 acres
Northern processing facilities	N/A	N/A	Area: 1,109.19 acres
Mine site transmission line	Area: 205.63 acres Length: 16.95 miles	Area: 280.53 acres Length: 23.07 miles	Area: 491.86 acres Length: 22.55 miles
Natural gas pipeline	Area: 24.16 acres Length: 3.31 miles	Same as Alternative B	Area: 39.15 acres Length: 2.14 miles
Brine/condensate pipeline	N/A	N/A	Area: 514.38 acres Length: 22.85 miles
Processing facilities water supply pipeline	Area: 247.13 acres Length: 24.66 miles	Same as Alternative B	Area: 61.32 acres Length: 6.35 miles
Mine site access road	Area: 58.60 acres Length: 16.11 miles	Area: 67.40 acres Length: 18.53 miles	Area: 167.87 acres Length: 13.84 miles
Rail line	Area: 1,022.66 acres Length: 20.89 miles	Area: 1,000.37 acres Length: 20.89 miles	N/A
Processing facilities access road	N/A	N/A	Area: 23.18 acres Length: 1.91 miles
Water intake transmission line	N/A	N/A	Area: 162.74 acres Length: 6.39 miles
Water intake access road	N/A	N/A	Area: 10.69 acres Length: 2.21 miles
Processing facilities landfill access road	N/A	N/A	Area: 4.60 acres Length: 0.62 mile

Note: N/A = not applicable.

* The acreage values for total disturbance are not the sum of all the acreage values for each Project element listed in the table. Because there is overlap of Project elements (either partially or wholly), the footprint for each alternative was used to determine the total disturbance.

2.5 Comparative Summary of Environmental Impacts

Table 2.5-1 summarizes and compares the anticipated environmental impacts from Alternative A (No Action), Alternative B (Proposed Action), Alternative C, and Alternative D (Preferred Alternative).

Table 2.5-1. Comparative Summary of Anticipated Environmental Consequences of the Proposed Action and Alternatives

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D (Preferred Alternative)
Air quality and greenhouse gas (GHG) emissions	No effect	Alternative B would cause an increase in criteria pollutant and hazardous air pollutant emissions compared to existing conditions. While the Project is associated with increases in criteria pollutants and HAPs, these increments would not lead to concentrations exceeding the National Ambient Air Quality Standards (NAAQS) or Wyoming Ambient Air Quality Standards (WAAQS) for nitrogen dioxide (NO₂), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter of 10 microns or less (PM₁₀), or particulate matter of 2.5 microns or less (PM_{2.5}). The Project would not pose any major impacts to nearby Class I areas. Impacts to specified Class II areas are projected; however, those impacts would not coincide with any population centers outside the Project property boundary. GHGs would be generated by stationary, portable, and mobile sources. Maximum annual emissions are estimated to be 3,880,233 MT per year of carbon dioxide equivalent (CO₂e).	Impacts would be similar to impacts associated with Alternative B.	Alternative D would cause an increase in criteria pollutant and hazardous air pollutant emissions above and beyond emission estimates for Alternative B. While the Project is associated with increases in criteria pollutants and HAPs, these increments would not lead to concentrations exceeding NAAQS or WAAQS for NO₂, CO, SO₂, PM₁₀, or PM_{2.5}. Alternative D does not pose any major impacts to nearby Class I areas. Impacts to specified Class II areas are projected; however, those impacts would not coincide with any population centers outside the Project property boundary. GHGs would be generated by stationary, portable, and mobile sources. Maximum annual emissions are estimated to be 3,892,889 MT per year of CO₂e.
Soil resources				
Direct impact (acres) to soils from Project footprint	No effect	Under Alternative B, approximately 6,322 acres of surface disturbance would occur that could impact soil functions, such as infiltration, percolation, stormwater amelioration, and groundwater recharge, as well as biological and chemical processes.	Impacts associated with Alternative C would be similar to Alternative B but would impact approximately 6,387 acres.	Impacts associated with Alternative D would be similar to Alternatives B and C but would impact approximately 7,012 acres.
Project impacts to soils susceptible to water erosion	No effect	Under Alternative B, approximately 197 acres of surface disturbance would occur on soils with high potential for water erosion (K factor over 0.4), which is 3.1% of the Project footprint, indicating a relatively low potential for water erosion and downstream sedimentation to occur.	Under Alternative C, impacts associated with soils with high potential for water erosion would be similar and slightly lower than Alternative B, with disturbance occurring to soils with K factor over 0.4 on 178 acres, which is 2.8% of the Project area.	Under Alternative D, impacts associated with soils with high potential for water erosion would be the same as Alternative C, with disturbance occurring to soils with K factor over 0.4 on 178 acres, which is 2.5% of this alternative footprint.

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D (Preferred Alternative)
Project impacts to soils susceptible to wind erosion	No effect	Under Alternative B, approximately 5,947 acres of surface disturbance would occur on soils with high potential for wind erosion (wind erodibility rating [WER]> 55), which is 94% of the Project footprint.	Impacts associated with Alternative C would be the same as Alternative B with an impact to soils with WER> 55 of approximately 5,999 acres, which is 94% of the alternative footprint.	Impacts associated with Alternative D would be similar to those under Alternative B, with an impact to soils with WER> 55 of approximately 6,797 acres, which is 97% of the alternative footprint.
Water resources	No effect	Under Alternative B, diversion from the Green River would result in an approximately 1.4% annual average flow of the Green River downstream of the diversion. In situ recovery mining would result in subsidence due to cavern development, resulting in permanent drawdown within the Laney aquifer.	Same as Alternative B.	Same as Alternative B.
Geology and mineral resources	No effect	For Alternatives B, C, and D, the area of potential impact is the mined area, which is 2,963 acres, and is the same size for all alternatives. Impacts in the mined area would be cavern collapse and related displacement expressed as subsidence at the ground surface. Under Alternatives B, C, and D, mining would remove trona in the lowermost beds (Trona Beds 1–4) via dissolution, creating 278 caverns that are predicted to collapse, with a total of 165 million tons of trona, 10% of the available mineral resources in the analysis area removed over the life of the mine.	Same as Alternative B.	Same as Alternative B.

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D (Preferred Alternative)
Cultural resources	No effect	Unavoidable impacts to cultural resources would occur, but impacts to historic properties would be avoided, minimized or mitigated. Physical impacts would include displacement, destruction, or disturbance of surface and subsurface cultural materials and exposure or burial of resources through increased sedimentation or erosion. Visual, auditory, or atmospheric impacts would be caused by modern industrial elements, which would impact traditional setting, feeling, and association within their historic context. Alternative B could impact 444 known cultural resources and a total of 763 projected cultural resources, including five historic trails (four NHTs and one candidate NHT), five known Tribal resources, and 107 projected Tribal resources. Eight known National Register of Historic Places (NRHP)–eligible resources (i.e., historic properties) are present within the Alternative B footprint and would be physically impacted by construction associated with the Proposed Action. All eight historic properties are precontact open camp sites; one of these resources also has Tribal resources associated with it. Sixty-six known NRHP-eligible resources (i.e., historic properties) are present within the Alternative B analysis area and could incur visual, auditory, or atmospheric impacts associated with construction of the Proposed Action. These historic properties include precontact, historic, and Tribal resources.	The impacts are the same as Alternative B, except that Alternative C could impact 295 known cultural resources and a total of 375 projected cultural resources, including five historic trails (four NHTs and one candidate NHT), four known Tribal resources, and 65 projected Tribal resources. Nine known NRHP-eligible resources (i.e., historic properties) are present within the Alternative C footprint and would be physically impacted by construction associated with Alternative C. Eight of these historic properties are precontact open camp sites, and one is a precontact lithic scatter; one of these resources also has Tribal resources associated with it. Fifty-one known NRHP-eligible resources (i.e., historic properties) are present within the Alternative C analysis area and could incur visual, auditory, or atmospheric impacts associated with construction of Alternative C. These historic properties include precontact, historic, and Tribal resources.	The impacts are the same as Alternative B except that Alternative D could impact 250 known cultural resources and a total of 908 projected cultural resources, including one historic trail, four known Tribal resources, and 117 projected Tribal resources. Nine known NRHP-eligible resources (i.e., historic properties) are present within the Alternative D footprint and would be physically impacted by construction associated with Alternative D. Eight of these historic properties are precontact open camp sites, and one is a precontact lithic scatter; one of these resources also has Tribal resources associated with it. Thirty-four known NRHP-eligible resources (i.e., historic properties) are present within the Alternative D analysis area and could incur visual, auditory, or atmospheric impacts associated with construction of Alternative D. These historic properties include precontact, historic, and Tribal resources.

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D (Preferred Alternative)
Paleontological resources	No effect	Removal of known paleontological resources or destruction of previously unknown paleontological resources would be an unavoidable, irreversible adverse effect on these resources. Construction would result in physical impacts (e.g., crushing or breaking) and could cause the erosion of fossils from exposed bedrock in areas of cleared vegetation or graded slopes. Increased human activity during future Project construction may impact paleontological resources through unauthorized collection or destruction of fossils by those accessing the analysis area or adjacent lands. Alternative B would directly impact 3,968.01 acres and indirectly impact 21,575.29 acres of Potential Fossil Yield Classification (PFYC) 5.	The impacts would be the same as Alternative B except that Alternative C would directly impact 4,109.17 acres and indirectly impact 22,899.52 acres of PFYC 5.	The impacts would be the same as Alternative B except that Alternative D would directly impact 4,829.63 acres and indirectly impact 15,670.43 acres of PFYC 5.
Vegetation resources	No effect	Impacts to the vegetation environment from mining construction, operations, and decommissioning/reclamation would disrupt native plant communities, potentially introduce and spread native and noxious plant species in previously healthy vegetative communities, and result in loss of individuals and loss of habitat for special status plant species. Under Alternative B, short- and long-term impacts to Existing Vegetation Types (EVTs) would total 6,430 acres. There is potential for impacts to special status plant species given the EVT that support such plant species.	The impacts would be the same as Alternative B except that under Alternative C, short- and long-term impacts to EVT would total 6,549.7 acres. Due to the smaller impacts to EVT that support special status plant species, potential impacts would be smaller than under Alternative B.	The impacts would be similar to those under Alternative B except short- and long-term impacts to EVT would total 7,571.2 acres. However, due to the more concentrated footprint and location of the processing facilities, potential impacts to special status plant species would be reduced compared to Alternative B.
Wetlands	No effect	Impacts to wetlands hydrology, soils, and vegetation from mining construction, operations, and decommissioning would impact the quality and quantity of wetlands within and adjacent to the Project footprint. Under Alternative B, impacts to National Hydrology Dataset (NHD)-mapped flowline drainages would total 19.62 miles, and impacts to National Wetlands Inventory (NWI)-mapped potential wetlands would total 92.40 acres.	The impacts would be the same as Alternative B except that under Alternative C, impacts to NHD-mapped flowline drainages would total 19.94 miles, and impacts to NWI-mapped potential wetlands would total 93.62 acres.	The impacts would be the same as Alternative B except that under Alternative D, impacts to NHD-mapped flowline drainages would total 23.51 miles, and impacts to NWI-mapped potential wetlands would total 98.95 acres.

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D (Preferred Alternative)
Fisheries and aquatic resources				
Instream disturbance (water quality)	No effect	The Project would impact fisheries and aquatics through instream disturbance from construction, operations, and reclamation. Under Alternative B, a total of 6.96 acres of temporary surface disturbance would impact sedimentation in downstream drainages.	The impacts would be the same as Alternative B except that under Alternative C, a total of 6.10 acres of temporary surface disturbance would impact sedimentation in downstream drainages.	The impacts would be the same as Alternative B except that under Alternative D, a total of 6.75 acres of temporary surface disturbance would impact sedimentation in downstream drainages.
Fish passage issues (fish passage, entrainment, entrapment)	No effect	The Project would impact fisheries and aquatics through fish passage issues resulting from construction, operations, and reclamation. Under Alternative B, the water intake structure would have a point of diversion on the outside of a meander bend and would be placed in a geologic bed formation to provide stability. The water intake structure would have a fine mesh screen to prevent entrainment and/or entrapment.	Same as Alternative B.	Same as Alternative B.
Water depletion (water flow, water levels)	No effect	The Project would impact fisheries and aquatics through the water intake structure, flow, water level, and depletion resulting from construction, operations, and reclamation. Under Alternative B, the total water depletion would be 14,500 acre-feet.	Same as Alternative B.	Same as Alternative B.
Wildlife resources				
ESA species	No effect	Under Alternative B, the yellow-billed cuckoo (<i>Coccyzus americanus</i>) western distinct population segment (DPS) would not be impacted. Approximately 2,929 acres of low habitat suitability, 3,377 acres of medium habitat suitability, and 14 acres of high habitat suitability of monarch butterfly (<i>Danaus plexippus</i>) habitat would be impacted, reducing the available abundance of flowering nectar plants during migration and milkweeds (<i>Asclepias</i> spp.) for reproductive purposes.	Impacts associated with Alternative C would be the same as Alternative B for the yellow-billed cuckoo western DPS. Impacts to monarch butterfly habitat would be the same as Alternative B, except impacts would occur on 2,997 acres of low habitat suitability and on 3,374 acres of medium habitat suitability.	Impacts associated with Alternative D would be the same as Alternative B for the yellow-billed cuckoo western DPS. Impacts to monarch butterfly habitat would be the same as Alternative B, except impacts would occur on 3,082 acres of low habitat suitability and on 3,930 acres of medium habitat suitability. High habitat suitability would not be impacted.

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D (Preferred Alternative)
Wyoming special status species	No effect	Under Alternative B, 6,484 acres of habitat for Wyoming special status species would be impacted. Additionally, the 37 miles of rail line and new access roads under Alternative B would pose a danger to Wyoming special status species via threat of collisions.	Impacts to habitat for Wyoming special status species would be the same as Alternative B, except impacts would occur on 6,562 acres. Additionally, the 39 miles of rail line and new access roads under Alternative C would pose a danger to Wyoming special status species via threat of collisions.	Impacts to habitat for Wyoming special status species would be the same as Alternative B, except impacts would occur on 7,583 acres. Additionally, the 14 miles of new access roads under Alternative D would pose a danger to Wyoming special status species via threat of collisions.
Big game	No effect	Under Alternative B, a total of 6,484 acres of big game habitat would be impacted, including 94 acres of pronghorn (<i>Antilocapra americana</i>) severe winter relief range and 1,849 acres of pronghorn crucial winter/yearlong range. The 37 miles of rail line and new access roads would pose a danger to big game via threat of collisions and would act as barriers to movement.	Impacts to big game habitat would be the same as Alternative B, except impacts would occur on 6,562 acres of big game habitat, including 72 acres of pronghorn severe winter relief range, and on 1,881 acres of pronghorn crucial winter/yearlong range. The 39 miles of rail line and new access roads would pose a danger to big game via threat of collisions and would act as barriers to movement.	Impacts to big game habitat would be the same as Alternative B, except impacts would occur on 7,583 acres of big game habitat, including 3,366 acres of pronghorn crucial winter/yearlong range, and on 0 acre of pronghorn severe winter relief range. The 14 miles of new access roads would pose a danger to big game via threat of collisions and would act as barriers to movement.
Migratory birds	No effect	Under Alternative B, 6,484 acres of habitat for migratory birds would be impacted.	Impacts to migratory bird habitat would be the same as Alternative B, except impacts would occur on 6,562 acres of habitat.	Impacts to migratory bird habitat would be the same as Alternative B, except impacts would occur on 7,583 acres of habitat.
Raptors	No effect	Under Alternative B, a total of 37 documented unknown species raptor nests would be within the 0.75-mile no surface occupancy (NSO). A total of 12 historically occupied ferruginous hawk (<i>Buteo regalis</i>) nests, three historically occupied bald eagle (<i>Haliaeetus leucocephalus</i>) nests, and nine historically occupied golden eagle (<i>Aquila chrysaetos</i>) nests would be within the 1.0-mile NSO.	Under Alternative C, a total of 35 documented unknown species raptor nests would be within the 0.75-mile NSO. A total of 14 historically occupied ferruginous hawk nests, three historically occupied bald eagle nests, and six historically occupied golden eagle nests would be within the 1.0-mile NSO.	Under Alternative D, a total of 12 documented unknown species raptor nests would be within the 0.75-mile NSO. A total of five historically occupied ferruginous hawk nests, zero historically occupied bald eagle nests, and nine historically occupied golden eagle nests would be within the 1.0-mile NSO.

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D (Preferred Alternative)
Greater Sage-Grouse	No effect	Alternative B would cause 117,797 acres and 202,599 acres of indirect impacts to priority habitat management areas (PHMAs) and general habitat management areas (GHMAs), respectively. It would cause 323.8 acres and 6,215.5 acres of direct impacts to PHMAs and GHMAs, respectively. It would result in neither direct nor indirect impacts to Sagebrush Focal Areas (SFAs). Alternative B would require 324 acres in the Project area to adhere to seasonal restrictions. It is within 4 miles of 10 leks.	Alternative C would cause 115,060 acres and 213,312 acres of indirect impacts to PHMAs and GHMAs, respectively. It would cause 355.5 acres and 6,244.9 acres of direct impacts to PHMAs and GHMAs, respectively. It would result in neither direct nor indirect impacts to SFAs. Alternative C would require 397.5 acres in the Project area to adhere to seasonal restrictions. It is within 4 miles of nine leks.	Alternative D would cause 74,241 acres and 152,693 acres of indirect impacts to PHMAs and GHMAs, respectively. It would cause 0 acres and 7,333.2 acres of direct impacts to PHMAs and GHMAs, respectively. It would result in neither direct nor indirect impacts to SFAs. Alternative D would require 972.1 acres in the Project area to adhere to seasonal restrictions. It is within 4 miles of six leks.
Livestock grazing	No effect	Alternative B would result in adverse direct impacts to grazing resources in the analysis area. Project construction would require clearing and grading actions that would remove vegetation and would fence off some vegetated areas, resulting in a loss of available forage and a decrease in the number of livestock that the analysis area can support. A total of 183 Animal Unit Months (AUMs) (0.94% of all AUMs in the analysis area) would be impacted. Additionally, the 37 miles of rail line and new access roads under Alternative B would pose a danger to livestock via threat of collisions. Additionally, impacts from increased traffic would create the potential for accidental release of animals, access concerns, and noxious weeds affecting vegetation.	Alternative C would result in adverse direct impacts to livestock grazing similar to those under Alternative B. A total of 253 AUMs (1.30% of all AUMs in the analysis area) would be impacted. Additionally, the 39 miles of rail line and new access roads under Alternative C would pose a danger to livestock via threat of collisions.	Alternative D would result in adverse direct impacts to livestock grazing similar to those under Alternative B. A total of 272 AUMs (1.40% of all AUMs in the analysis area) would be impacted. Additionally, the 14 miles of new access roads under Alternative D would pose a danger to livestock via threat of collisions.

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D (Preferred Alternative)
Health and human safety/hazardous materials	No effect	The proposed solution mining plan in Sections 23–26 encompasses almost the entirety of each section, while in Section 35, the solution mining plan (presently) encompasses the northern half of the section. Sodium carbonate refining, associated processing components, and rail car loading components would encompass all of Sections 27, 22, and the eastern half of Section 28, respectively. Based on the foregoing, the affected environment is the indicated sections plus a 250-foot buffer, for a total of approximately 4,839 acres. The proposed railroad transportation spur line ROW and 250-foot buffer would encompass approximately 1,425 acres. Public access highways would cross the railroad ROW and buffer nine times for a total length of 4,958 feet. Public access highways would cross the rail car loading area twice for a total of approximately 748 feet. Public access highways would cross Sections 25 and 35 for a total of 8,318 feet. Two-track access to the solution mining area would be approximately 7.0 miles.	No change from Alternative B, except for the location of the 230-kV transmission line. Public access roadways and two-track crossings of the proposed railroad transportation spur line, rail car loading area, and solution mining sections would remain the same.	The proposed solution mining plan would include Sections 23–27, with surface components (e.g., low total alkalinity pond, solution mining pump station, landfill, etc.) confined to Section 22. The processing facility area would be crossed by three public access roadways. Public access roadway access to the solution mining area would remain the same as Alternative B or Alternative C. Two-track access to the solution mining sections would increase to 9.5 miles.
Lands and realty				
Land use authorizations	No effect	Under Alternative B, 1,421 acres of new permanent ROW outside the existing lease area would be required. There would be no impacts to existing land use authorizations or designated corridors. Potential future projects would be subject to additional siting, design, schedule, cost, and construction considerations to avoid Project facilities and infrastructure.	The impacts would be the same as Alternative B, except that under Alternative C, 1,505 acres of new permanent ROW outside the existing lease area would be required.	The impacts would be the same as Alternative B, except that under Alternative D, 1,986 acres of new permanent ROW outside the existing lease area would be required.
Land tenure	No effect	Under Alternative B, the presence of the rail line could potentially increase or decrease the value of a 641-acre parcel identified for disposal in the Kemmerer RMP, affecting the BLM's ability to dispose of the lands, effectively manage and consolidate its lands, and acquire new properties.	Same as Alternative B.	No impact.

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D (Preferred Alternative)
Recreation	No effect	Under Alternative B, recreational opportunities and experiences would be impacted on 2,946 acres because of new disturbance, including direct impacts to 9 acres of Flaming Gorge NRA, 0.24 mile of National Historic Trails (NHTs), and 0.74 mile of the Flaming Gorge-Green River Scenic Byway. Impacts to hunting opportunities within big game habitat (antelope, elk, moose, and mule deer) would occur on 4,984 acres. Direct impacts to hunting opportunities within big and small game and game bird habitat would occur on 4,984 acres. Long-term impacts to big game hunting are likely given loss and avoidance of currently suitable habitat, increased vehicle collisions, and the subsequent population declines.	The impacts would be the same as Alternative B, except recreational opportunities and experiences would be impacted on 2,986 acres of BLM lands.	The impacts would be the same as Alternative B, except recreational opportunities and experiences would be impacted on 3,325 acres. There would be no direct impacts to Flaming Gorge NRA or NHTs. Impacts to hunting opportunities for big game habitat (antelope, elk, moose, and mule deer) would occur on 6,093 acres. Direct impacts to hunting opportunities within big and small game and game bird habitat would occur on 6,093 acres. Long-term impacts to big game hunting are likely given loss and avoidance of currently suitable habitat, increased vehicle collisions, and the subsequent population declines.
Socioeconomics	No effect	Relative to Alternative A, Project construction and operations would stimulate economic activity by creating an average of 3,091 jobs during the 4 years of construction and 530 jobs during the years of operations. Worker influx during construction may lead to a tightening of the housing market and increased demand for public services. During both construction and operations, local government revenues would increase an estimated \$5 million to \$10 million annually. Adverse impacts among members of low-income, minority, and Tribal communities may occur but would be limited to changes in air quality and viewshed alterations as experienced by individuals located within 5 miles of the Project. There would be impacts to the agriculture and grazing industry, with an estimated 183 permitted AUMs impacted under Alternative B, which would be 0.94% of the AUMs in the livestock grazing analysis area.	The socioeconomic impacts under Alternative C are expected to be essentially the same as those under Alternative B, except an estimated 253 permitted AUMs would be impacted, which would be 1.30% of the AUMs in the livestock grazing analysis area.	The socioeconomic impacts under Alternative D are expected to be essentially the same as those under Alternative B, except an estimated 272 permitted AUMs would be impacted, which would be 1.40% of the AUMs in the livestock grazing analysis area. In addition, there would be a modest increase in labor and non-labor expenditures during construction.

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D (Preferred Alternative)
Travel and transportation	No effect	Under Alternative B, there would be less than a 1% increase in annual average daily traffic (AADT) along I 80 during operations; 0.8% to 7.3% increase in AADT along WY 530 during construction; 943% increase in AADT along WY 374 during construction, and a 1,619% increase in AADT during operations. Additional traffic would require a new deceleration/right-turn lane for westbound traffic and a dedicated left-turn lane for eastbound traffic on WY 374. There would be no impact to Tenneco Road or WY 372.	Under Alternative C, there would be a 3.3% to 5.8% increase in AADT along I 80 during construction and a 5.9% to 10.3% increase in AADT during operations. Impacts to WY 530 would be the same as Alternative B. No improvements to WY 374 would be required. There would be no impact to Tenneco Road or WY 372.	Under Alternative D, there would be less than a 1% increase in AADT along I 80 during both construction and operations and no overpass over I 80. Impacts to WY 530 would be the same as Alternative B. No improvements to WY 374 would be required. There would be an 18.1% increase in AADT along Tenneco Road during construction and a 14.3% increase during operations. There would be a 60.1% increase in AADT along WY 372 during construction and a 102.1% increase during operations.
Visual resources				
Landscape character and scenic quality	No effect	Foreground/middleground: The Chicken Draw Scenic Quality Rating Unit (SQRU) would be the most impacted SQRU with the placement of the mining boundary, Project facilities, and all linear components occurring within this SQRU. Six SQRUs would experience a minor degree of visual change primarily due to the presence of linear facilities. Background: The Chicken Draw SQRU would be the most impacted SQRU with the placement of the mining boundary, Project facilities, and all linear components occurring within this SQRU. One SQRU would experience a minor degree of visual change primarily due to the presence of linear facilities passing through the SQRUs. Beyond background: The Chicken Draw SQRU would be the most impacted SQRU with the placement of the mining boundary, Project facilities, and all linear components occurring within this SQRU. Two SQRUs would experience a minor degree of visual change primarily due to the presence of linear facilities passing through the SQRUs.	Impacts associated with Alternative C would be similar to impacts associated with Alternative B.	The degree of disturbance within the mine permit boundary would be less than Alternatives B and C with the relocation of Project facilities; however, the relocation of Project facilities associated with Alternative D would increase the overall visual disturbance and footprint of the Project.

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D (Preferred Alternative)
Sensitivity	No effect	The Project would introduce visible landscape changes to approximately 25,285.8 acres (19%) of the total acres of low sensitivity units in the visual analysis area. The Project would introduce visible landscape to approximately 4,631.3 acres (14%) of the total acres of moderate sensitivity units in the visual analysis area. The Project would also introduce visible landscape changes to approximately 37,391.9 acres (21%) of the total acres of high sensitivity units in the visual analysis area.	Impacts associated with Alternative C would be similar to impacts associated with Alternative B.	Impacts associated with Alternative D would be similar to impacts associated with Alternatives B and C.
Vehicle travel routes	No effect	Impacts to vehicle travel routes from the introduction of Project components within the landscape would range from low to none. Low impacts would be associated with Flaming Gorge Scenic Byway, WY 374 – Oregon and California NHTs Auto Tour Route/Trona Byway/I 80, and WY 374/I 80.	Impacts associated with Alternative C would be similar to impacts associated with Alternative B.	Travelers would see Project facilities (geometrical shapes, large industrial infrastructure, steam/vapor cloud, etc.) in greater detail than under Alternatives B and C.
Tourists, visitors, and recreational users	No effect	Impacts to tourists, visitors, and recreational users from the introduction of Project components within the landscape would range from low to none. Low impacts would be associated with Flaming Gorge Scenic Byway, WY 374 – Oregon and California NHTs Auto Tour Route/Trona Byway/I 80, and Granger Community Park.	Impacts associated with Alternative C would be similar to impacts associated with Alternative B.	Alternative D would introduce a large-scale industrialized cultural modification adjacent to roadways that would change the primary naturalized landscape into a more industrialized landscape. Long-term disturbance during the operations phase of the Project would be similar in nature to Alternative B but would introduce additional miles of linear components.
National Historic Trails	No effect	Although construction of the Project would add to the degree of visual disturbance, the disturbance it would cause NHTs during the life of the Project would be minimal, if not negligible, compared to existing disturbance.	Impacts associated with Alternative C would be similar to impacts associated with Alternative B.	No visual impacts to National Historic Trails would occur.
Residents	No effect	There would be no impact to residents due to the exiting topography, vegetation, and distance from the Project.	Impacts associated with Alternative C would be similar to impacts associated with Alternative B.	Impacts associated with Alternative D would be similar to impacts associated with Alternatives B and C.
Night skies	No effect	The pristine sky areas would be negatively affected by the development of the Project; however, current existing mining operations and facilities show a negligible degree of night sky disturbance and light pollution.	Impacts associated with Alternative C would be similar to impacts associated with Alternative B.	Lighting associated with Project facilities would not be consolidated to one area as under Alternatives B and C but would be spread out over two areas and would decrease overall density.

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D (Preferred Alternative)
Decommissioning	No effect	Degrees of visual change from decommissioning would differ from construction in that lands previously disturbed throughout the Project would likely become less visible over time because of reclamation activities and revegetation.	Impacts associated with Alternative C would be similar to impacts associated with Alternative B.	Impacts associated with Alternative D would be similar to impacts associated with Alternatives B and C.
Fire and fuels	No effect	Impacts to fire environment and fire management from Project construction, operations, and decommissioning activities could include changes to fuels, increased sources of ignition, changes to fire regimes, and changes to fire response strategies. Under Alternative B, there would be low to moderate impacts on the fire environment. The total surface disturbance area would be 6,322 acres.	The impacts would be the same as Alternative B except that the Alternative C linear features would be slightly longer. Therefore, with increased traffic and more miles of transmission line, there is potential for increased ignitions relative to the Proposed Action. The total surface disturbance area would be 6,346 acres.	The impacts would be the same as Alternative B except that the Alternative D linear features would be slightly longer and the Project footprint would be slightly larger. In addition, Alternative D has a modestly larger shrub acreage within the fire behavior analysis area, which may experience a greater increase of grass invasion and potential shrub loss. With increased traffic and more miles of transmission line, there is the potential for increased ignitions relative to the Proposed Action. The total surface disturbance area would be 7,012 acres.

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Introduction

This chapter describes the existing environment in the context of the natural resources and human uses that have the potential to be affected by the Proposed Action and alternatives presented in Chapter 2. This chapter also presents an evaluation of the potential environmental consequences resulting from implementation of the Proposed Action and alternatives.

For each resource, the analysis describes the following types of effects:

- **Direct effects:** Effects that are caused by activities associated with the Proposed Action and alternatives and occur at the same time and in the same general location.
- **Indirect effects:** Effects that occur at a different time or in a different location than the action(s) to which the effects are related.
- **Cumulative effects:** Effects that result from the incremental effect of the Proposed Action and alternatives when added to other past, present, and future actions.
- **Irretrievable effects:** Effects that continue until the resource is reclaimed/restored.
- **Irreversible effects:** Effects that would be permanent because the resource cannot or would not be reclaimed/restored.

Discussions of direct and indirect effects may be combined as appropriate in the sections below. Sources that were used to complete the analyses in this chapter include reports, data, and other information provided by BLM managers and resource specialists, Pacific Soda and its contractors, and/or federal and state agencies. These sources were complemented by literature searches, electronic searches, personal interviews, and geographic information system (GIS) data.

3.2 Cumulative Impact Assessment Methodology

A cumulative impact is an effect on the environment that results from the incremental effect of the action when added to other past, present, and future actions regardless of which agency (federal or nonfederal) or person undertakes such actions. Cumulative impacts may result from individually minor but collectively significant actions occurring over a period of time. The cumulative impacts of the Project alternatives and past, present, and reasonably foreseeable future actions (RFFAs) are described below for each resource.

The cumulative impact of past and present actions in this Final EIS is represented through the description of the affected environment for each resource as presented below. The RFFAs identified by the BLM as potentially contributing to cumulative impacts in the greater vicinity of the Project area include current projects that are expected to continue into the future, are part of clearly documented management plans, or are actively proposed. They do not include speculative actions (not proposed or developed at a level to allow analysis) or pending management plans that have not progressed enough to develop proposed management. A description of the RFFAs and a map showing their general location is included in Appendix E.

3.3 Air Quality and Greenhouse Gas Emissions

Air quality conditions are a valuable resource from an aesthetic and human health perspective, and they are subject to specific regulations that aim to protect that resource. Local and regional aspects of air quality may be affected by the Proposed Action and alternatives during construction, operations, and closure and reclamation. The applicable federal and state regulations and policies establish thresholds for evaluating air quality impacts, and this section includes a description of the existing environment and potential consequences (impacts on air quality) of the Proposed Action and alternatives under that regulatory framework. The regulatory framework protects aesthetic and human health conditions. Beyond regulation of specific contaminants, the BLM has further responsibility to consider the impacts of air quality to special areas such as wilderness and national parks, and these effects are also considered in this section.

The BLM modeled the impacts of the proposed Project emissions on ambient air quality to support the preparation of this EIS to evaluate the potential environmental effects. Based on several rounds of review and consultations with various regulatory agencies (U.S. Environmental Protection Agency [EPA], National Park Service [NPS], USFS, and Wyoming DEQ), the potential Project impacts on Air Quality Related Values (AQRVs) in the nearby Class I areas and requested Class II areas were evaluated. Specifically, the Class I areas include the Bridger Wilderness, Fitzpatrick Wilderness, Flat Tops Wilderness, Mount Zirkel Wilderness, Grand Teton National Park, Washakie Wilderness, Teton Wilderness, and Arches National Park, while the requested Class II areas include Flaming Gorge National Recreation Area, Fossil Butte National Monument, and Dinosaur National Monument. The AERMOD modeling system was used to determine impacts in the near field of the source or facility. A separate model platform, CALPUFF, was used to determine far field impacts from 50 to 300 kilometers (km) from the facility or operation. Each model requires a separate set of meteorological data to capture the atmospheric dispersion characteristics, and each model produces a gridded output of impacts at ground-level receptors.

In an effort to capture cumulative effects from concurrent projects, emissions from the neighboring Project West Trona Mine Project (Project West) have been included in this analysis. Project West is located immediately adjacent to the Dry Creek Project. Other RFFAs including the American Soda Solution Mining Expansion, Southwest Wyoming Carbon Dioxide Sequestration, and Sweetwater Carbon Storage Hub project emissions are not publicly available at this time, and therefore cannot be quantified in the Final EIS. Without quantified emissions, these projects were unable to be incorporated into the dispersion modeling (near or far field). Project West emissions for the cumulative near-field effects are included in the Final EIS along with refinements to far-field modeling that has been performed after the submittal of the Draft EIS.

The affected environment for Project-related air quality impacts encompasses the area within a 300-km (186-mile) radius of the center of the Project area (Appendix Q, Figure 3.3-1). This analysis area captures the area in which construction, operations, and reclamation activities would occur, including transportation and transmission line routes within a 300-km radius of the Project area. The area of analysis for climate is the global atmosphere.

3.3.1 Affected Environment

3.3.1.1 Air Quality

The primary factors that influence regional air quality are the locations of air pollution sources, the quantity and chemical characteristics of the pollutants emitted by those sources, the topography of the region, and the local meteorological conditions. Potential direct and indirect impacts to air quality from

the proposed Project have been assessed for the pre-mining, active mining, and final reclamation and closure phases of the Project and spatially within the anticipated geographic pollutant dispersion range.

3.3.1.2 Criteria Pollutants

Air quality and pollutant emissions are regulated under the federal CAA regulations and Wyoming state laws and regulations implemented by the Wyoming DEQ Air Quality Division. Both federal and state regulations require that ambient concentrations for specific criteria pollutants not exceed allowable levels, referred to as Ambient Air Quality Standards (AAQS). These standards have been established by the EPA and the State of Wyoming at levels deemed to preclude adverse impacts on human health and welfare with an adequate margin of safety. There are two series of National Ambient Air Quality Standards (NAAQS) (EPA 2021a). The primary standards are designed to provide an adequate margin of safety essential to protecting public health. The secondary standards are intended to protect public welfare from any known or anticipated adverse effects associated with the presence of a criteria pollutant in the ambient air. The EPA has set air quality standards for the following criteria pollutants: nitrogen dioxide (NO₂), sulfur dioxide (SO₂), carbon monoxide (CO), particulate matter smaller than 10 microns in aerodynamic diameter (PM₁₀), particulate matter smaller than 2.5 microns in aerodynamic diameter (PM_{2.5}), ozone (O₃), and lead. The State of Wyoming has incorporated some of the NAAQS by reference, but does have its own additional ambient air quality standards, the Wyoming Ambient Air Quality Standards (WAAQS). A comparison of the NAAQS and WAAQS is provided in Table 3.3-1.

On February 7, 2024, the EPA lowered the primary annual NAAQS for PM_{2.5} from 12 micrograms per cubic meter (µg/m³) down to 9 µg/m³ (EPA 2023a). The new annual PM_{2.5} standard (9 µg/m³) has been applied to the analysis.

Table 3.3-1. Pollutant Standards and Averaging Periods

Pollutant	Averaging Period	SIL (µg/m ³)	NAAQS	WAAQS	PSD Class I Increment (µg/m ³)	PSD Class II Increment (µg/m ³)
PM ₁₀	24-hour*	5	150 µg/m ³	150 µg/m ³	8	30
	Annual†	1	None	50 µg/m ³	4	17
PM _{2.5}	24-hour‡	1.2	35 µg/m ³	35 µg/m ³	2	9
	Annual§	0.13***	9 µg/m ³	9 µg/m ³	1	4
NO ₂	1-hour¶	7.5	100 ppb	100 ppb	None	None
	Annual#	1	53 ppb	53 ppb	2.5	25
O ₃	8-hour	1.96***	70 ppb	70 ppb	None	None
SO ₂	1-hour**	7.8	75 ppb	75 ppb	None	None
	3-hour††	25	0.5 ppm	0.5 ppm	25	512
	24-hour‡‡	5	None	None	5	91
	Annual§§	1	None	None	2	20
CO	1-hour¶¶	2,000	35 ppm	35 ppm	None	None
	8-hour###	500	9 ppm	9 ppm	None	None

Source: EPA (2023b); Wyoming DEQ (2023).

Notes: PSD = Prevention of Significant Deterioration; SIL = Significant Impact Level; ppm = parts per million; ppb = parts per billion.

* 24-hour PM₁₀ SIL is the maximum 24-hour concentration. The 24-hour PM₁₀ increment standard is the maximum 24-hour concentration not to be exceeded more than once per year.

† The annual PM₁₀ SIL, WAAQS standard, and increment standard are the annual arithmetic mean.

‡ The 24-hour PM_{2.5} increment standard is maximum 24-hour concentration not to be exceeded more than once per year.

§ The annual PM_{2.5} SIL and increment standard are the annual arithmetic mean.

[†] The 1-hour NO₂ modeling significance level is an interim SIL set forth by the EPA based on approximately 4% of the 1- hour NAAQS/WAAQS.

[#] The annual NO₂ SIL, NAAQS/WAAQS standard, and increment standard are the annual arithmetic mean.

^{**} The 1-hour SO₂ modeling significance level is an interim SIL set forth by the EPA based on 4% of the 1-hour NAAQS/WAAQS.

^{††} The 3-hour SO₂ NAAQS/WAAQS standard is the second-highest successive non-overlapping 3-hour concentration not to be exceeded more than once per year.

^{‡‡} The 24-hour SO₂ SIL and WAAQS standard are the maximum 24-hour concentration. The 24-hour increment standard is the maximum 24-hour concentration, not to be exceeded more than once per year.

[§] The annual SO₂ SIL, WAAQS standard and increment standard are the annual arithmetic mean.

^{¶¶} The 1-hour CO SIL is the maximum 1-hour concentration. The 1-hour NAAQS/WAAQS standard is the maximum 1-hour concentration, not to be exceeded more than once per year.

^{###} The 8-hour CO SIL is the maximum 8-hour concentration. The 8-hour CO NAAQS/WAAQS standard is the maximum 8-hour concentration, not to be exceeded more than once per year.

^{***} Recommend SIL (EPA 2024).

The National Emissions Inventory is a detailed annual estimate of criteria pollutants and hazardous air pollutants (HAPs) from air emission sources maintained by the EPA. Emissions inventories provide an overview of the types of pollution sources in the area, as well as the amount of pollution being emitted on an annual basis. Emissions inventories are useful in comparing emission source categories (agriculture, biogenic, dust, fire, fuel combustion, industrial process, and mobile) to determine which industries or practices are contributing to the general level of pollution in an area. Table 3.3-2 summarizes the emission inventory data for Sweetwater County from the most recent National Emissions Inventory, which was conducted in 2020. Existing major sources within Sweetwater County include various compressor stations, a power plant (Jim Bridger Plant), multiple trona mining and production/refining facilities, a chemical processing plant (Rock Springs Fertilizer Complex), and a landfill (Rock Springs Landfill).

Table 3.3-2. 2020 Emissions Inventory in Tons per Year for Sweetwater County

Source	CO (tpy)	NO _x (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	VOC (tpy)	HAPs (tpy)	CO ₂ e (MTpy)
Agriculture	–	–	–	628.10	127.38	12.00	0.96	–
Biogenics*	2,991	1,310	–	–	–	9,597	2,919	–
Dust	–	–	–	14,447	1,470	–	–	–
Facility point sources	20,076	16,229	12,998	5,818	3,574	25,262	2,624	17,285,396
Fires	977.41	18.96	9.07	104.45	88.52	232.17	73.25	15,905
Fuel combustion	912.97	75.24	4.36	137.75	137.58	147.45	56.76	–
Industrial processes [†]	13.25	13.45	0.05	0.64	0.64	248.87	15.81	–
Miscellaneous [‡]	67.14	2.30	0.52	42.17	38.74	1,643	122.66	–
Mobile	7,810	4,693	6.09	158.73	122.26	569.87	171.73	1,120,000
Total	32,848	22,342	13,018	21,336	5,559	37,712	5,984	18,421,301

Source: EPA (2023c).

Note: NO_x = nitrogen oxides; SO_x = sulfur oxides; VOC = volatile organic compound; CO₂e = carbon dioxide equivalent. CO₂e emissions are listed in MTpy.

* Biogenics include those emissions derived from natural processes (such as vegetation and soil).

[†] Industrial processes includes various product mining categories, specifically soda ash production. [‡] Miscellaneous categories include bulk gasoline terminals, waste disposal, commercial cooking, gas stations, miscellaneous non-industrial (not elsewhere classified), and solvent use.

Fugitive dust sources are the biggest contributors to PM₁₀ (68% of emissions). Facility point sources are the biggest contributors to PM_{2.5} (64% of emissions), CO (61% of emissions), nitrogen oxides (NO_x) (73% of emissions), sulfur dioxide (SO₂) (99.8% of emissions), volatile organic compounds (VOCs) (67% of emissions), and carbon dioxide equivalent (CO₂e) (99% of emissions). Biogenic sources are the biggest contributors to HAPs (making up 87% of emissions).

The General Conformity Rule was established under CAA Section 176(c)(4) and implemented in 40 CFR 93; it serves to ensure that federal actions do not inhibit state attainment plans for areas designated as nonattainment or maintenance. The rule effectively applies to all federal actions that take place in areas designated as nonattainment or maintenance. In July 2012, the EPA designated portions of Sweetwater County as an O₃ nonattainment area for the 2008 Ozone NAAQS, collectively known as the Upper Green River Basin Ozone Nonattainment Designation Area. However, the Project is not located within the boundaries of the Upper Green River Basin Ozone Nonattainment Designation Area. Sweetwater County is in attainment for all other pollutants for which there are NAAQS (EPA 2023d). Because the Project is not located in a nonattainment or maintenance area, the General Conformity Rule is not applicable.

3.3.1.3 Background Pollutant Concentrations

Monitored pollutant concentrations, termed background concentrations, are considered to be representative of prevailing air pollution from existing sources in the region. These background concentrations are added to the modeled ambient concentrations from Project emissions to estimate the total ambient concentrations at the modeled receptor locations. Table 3.3-3 provides the background concentrations (in units of parts per billion [ppb] and/or µg/m³) representative of the Project area.

Table 3.3-3. Representative Background Concentrations for the Project

Pollutant	Averaging Time	Background Concentration		Data Source
		(ppb)	(µg/m ³)	
CO [¶]	8-hour	815	–	Monitor 56-021-0100 NCore. Cheyenne, WY, 2018–2020 (highest 2nd high)
	1-hour	700	–	Monitor 56-021-0100 NCore. Cheyenne, WY, 2018–2020 (highest 2nd high)
NO ₂ [*]	Annual	1.3	–	Monitor 56-037-0300 Moxa Arch, Rock Springs, WY, 2019–2021 (annual average)
	1-hour	16.3	–	Monitor 56-037-0300 Moxa Arch, Rock Springs, WY, 2019–2021 (3-year average 98th percentile)
PM ₁₀ [§]	Annual	–	7.8	Monitor 56-037-0300, Moxa Arch, Rock Springs, WY, 2019–2021 (annual average)
	24-hour	–	47.7	Monitor 56-037-0300, Moxa Arch, Rock Springs, WY, 2019–2021 (2nd high max average)
PM _{2.5} [‡]	Annual	–	5.2	Monitor 56-037-0007, South Pass, Rock Springs, WY, 2017–2019 (annual mean)
	24-hour	–	18.0	Monitor 56-037-0007, South Pass, Rock Springs, WY, 2017–2019 (3-year average 98th percentile)
SO ₂ [§]	3-hour	9.5	–	Monitor 56-037-0300, Moxa Arch 2019–2021 (highest 2nd high)
	1-hour	8.3	–	Monitor 56-037-0300, Moxa Arch 2019–2021 (average 99th percentile)
O ₃	8-hour	62	–	Monitor 56-037-0077, Hiawatha Green 2018–2020 (4th highest maximum average)

Source: EPA (2023e).

* Data from Moxa Arch monitor for the years 2019–2021.

† Data from Hiawatha Green Site monitor for the years 2018–2020. Data for calendar year 2021 does not satisfy minimum data completeness criteria.

‡ Data from Rock Springs monitor for the years 2017–2019. Data for calendar years 2020 and 2021 does not satisfy minimum data completeness criteria.

§ Data from Moxa Arch monitor for the years 2019–2021.

¶ Data from Cheyenne NCore monitor for the years 2018–2020. Data for calendar year 2021 does not satisfy minimum data completeness criteria.

3.3.1.4 Hazardous Air Pollutants

In addition to the criteria pollutant emissions, over 100 tons per year (tpy) of total HAPs would be emitted from the proposed Project sources. Hazardous air pollutants can cause various adverse health effects. They are not part of the NAAQS, but high levels at the property boundary could indicate the need for further analysis and/or mitigation strategies. Therefore, HAPs have been included in the emission inventory (i.e., benzene, toluene, ethylbenzene, xylene, n-hexane, formaldehyde, and acetaldehyde) and would be modeled in the AERMOD near-field analysis. Near-field HAP concentrations would be calculated for assessing impacts both for short-term (acute) exposure assessment and for calculation of long-term risk.

The proposed HAP impact assessment includes the comparison of the modeled HAPs concentrations against the following health exposure levels:

- Reference Exposure Levels (RELs) – The RELs are for assessing acute inhalation exposures (i.e., 1-hour average) and represent the concentration at or below which no adverse health effects are expected.
- Reference Concentrations (RfC) – The RfCs represent an estimate of the chronic inhalation exposure (i.e., annual average) rate to humans, including sensitive subgroups (children and elderly), without an appreciable risk of harmful effects.

Table 3.3-4 provides the RELs and RfCs for the HAPs that could be emitted from the proposed Project.

Table 3.3-4. Hazardous Air Pollutants Reference Exposure Levels and Reference Concentrations

Pollutant/HAP	REL (µg/m³)	RfC* (µg/m³)	Inhalation Unit Risk† (1/µg/m³)
Formaldehyde	55‡	9.8	1.3E-05
Acetaldehyde	470‡	9	2.2E-06
Benzene	27‡	30	7.8E-06
Toluene	7,500§	5,000	N/A
Ethylbenzene	22,000§	1,000	2.5E-06¶
Xylenes	8,700§	100	N/A
n-Hexane	180,000#	700	N/A

Note: N/A = not available.

* Regional Screening Level Resident Ambient Air Table May 2022 (<https://semsspub.epa.gov/work/HQ/402381.pdf>).

† Integrated Risk Information System

‡ California EPA REL for no adverse effects. Table 2. Acute Dose-Response Values for Screening Risk Assessments (EPA 2021a).

§ Agency for Toxic Substances and Disease Registry minimal risk levels for no adverse effects for 1 to 14-day exposures. Table 2. Acute Dose-Response Values for Screening Risk Assessments (EPA 2021a).

Values referenced from National Institute for Occupational Safety and Health REL.

¶ California EPA Table 1. Prioritized Chronic Dose-Response Values (EPA 2021b).

3.3.1.5 Class I and Class II

Section 169A of the CAA established a national visibility goal to prevent future visibility impairment and remedy any existing impairment in Class I areas. Visibility refers to the clarity with which scenic vistas and landscape features are perceived at great distances. Impairment refers to human-caused air pollution. In 1999, the EPA promulgated the Regional Haze Rule to address regional haze, which refers to haze that impairs visibility in all directions over a large area. Haze forms when sunlight encounters particle

pollution in the air. The Regional Haze Rule calls for state and Federal agencies to work together to establish goals and emission reduction strategies to improve visibility in Class I areas. States are required to address visibility in their state implementation plans.

The Interagency Monitoring of Protected Visual Environments (IMPROVE) program was initiated in 1985 to establish current visibility conditions and trends in national parks and wilderness areas. Average visual range in many Class I areas in the western United States is 100 to 150 km (60 to 90 miles), equivalent to 13.6 to 9.6 deciviews (dv), or about 50% to 70% of the visual range that would exist without anthropogenic air pollution from stationary and mobile sources (64 *Federal Regulations* 35714). Deciview is defined as the unit of measurement of haze or *haze index*. It is a measure of visibility derived from light extinction that is designed so that incremental changes in the haze index corresponds to uniform incremental changes in visual perception. Designation as a Class I area allows only very small increments of new pollution above already existing air pollution levels. Class I areas include national parks larger than 6,000 acres and wilderness areas larger than 5,000 acres that were in existence before August 1977.

No federal Class I areas are located within 100 km (60 miles) of the Project Area, with the closest Class I area, the Bridger Wilderness, being located approximately 150 km (90 miles) to the north of the Project Area. The Bridger Wilderness IMPROVE station was used for characterization of the baseline regional haze level in the indirect effects analysis area using data for the period from 2000 to 2009. Over that time period, the standard visual range has improved by approximately 4% (Colorado State University 2023).

Federal Class I areas to be evaluated consist of the following:

- Bridger Wilderness (149 km [93 miles] northeast)
- Fitzpatrick Wilderness (186 km [116 miles] northeast)
- Flat Tops Wilderness (244 km [152 miles] southeast)
- Mount Zirkel Wilderness (250 km [155 miles] southeast)
- Grand Teton National Park (256 km [159 miles] northwest)
- Washakie Wilderness (264 km [164 miles] north)
- Teton Wilderness (270 km [168 miles] north)
- Arches National Park (277 km [172 miles] south)

The analysis of these areas includes air quality impacts, compared with ambient standards and Prevention of Significant Deterioration (PSD) increments, visibility or haze, and deposition of total sulfur and nitrogen. Several Class II areas are located within the modeling domain for which ambient air and AQRV impacts assessments are not mandatory but have been requested. These Class II areas consist of the following:

- Flaming Gorge National Recreation Area (12 km [7.5 miles] east)
- Fossil Butte National Monument (92 km [57 miles] northwest)
- Dinosaur National Monument (79 km [49 miles] southeast)

According to NPS data for Class I areas in the planning area, visibility trends recorded in Grand Teton National Park and Arches National Park remained relatively unchanged from 2012 to 2021 (the 10-year trend shows no statistically significant trend on the 20% clearest days and 20% haziest days). Visibility at all listed areas is currently classified as “fair,” with the 5-year average (2017–2021) measured visibility or haze index, on mid-range days of 4.8 dv at Grand Teton National Park and 5.4 dv at Arches National

Park. For Grand Teton National Park, the haze index is 2.3 dv above the estimated natural condition of 2.5 dv. For Arches National Park, the haze index is 2.4 dv above the estimated natural condition of 3.0 dv (NPS 2023).

Wet nitrogen deposition levels create poor conditions for ecosystem health at both Grand Teton National Park and Arches National Park. For Grand Teton National Park, this is based on the 5-year average (2017–2021) estimated 1.7 to 6.6 kilograms per hectare per year (kg/ha/yr) range of wet nitrogen deposition compared to nitrogen deposition benchmarks. To maintain the highest level of protection, the maximum of this range (6.6 kg/ha/yr) is used. For Arches National Park, this is based on the 5-year average (2017–2021) estimated 1.0 to 1.3 kg/ha/yr range of wet nitrogen deposition compared to nitrogen deposition benchmarks. To maintain the highest level of protection, the maximum of this range (1.3 kg/ha/yr) is used. A level of 1.3 kg/ha/yr normally indicates fair condition. However, the condition has been reduced to poor because ecosystems at Arches National Park may be very highly sensitive to nitrogen-enrichment effects relative to all inventory and monitoring parks. Nitrogen-enrichment effects may include disruption of soil nutrient cycling and reduced biodiversity of some plant communities, including alpine, arid, grassland, and wetland plants at the park (NPS 2023).

The Bridger and Fitzpatrick Wilderness Areas are protected Class I Areas located in the Bridger-Teton and Shoshone National Forests in western Wyoming. An IMPROVE monitor was established at the White Pine Ski Area, east of Pinedale, Wyoming, in 1988 to assess visibility impairment at these Class I areas. An analysis of the monitoring data indicates that organic matter is the largest contributor to visibility impairment. Based on the most recent measured visibility, these wilderness areas are experiencing improvements in regional haze faster than the uniform rate of progress required to meet natural background conditions by 2064. Additionally, many emission reductions that are required as part of the Regional Haze State Implementation Plan process will occur over the next several years, so significant improvements in visibility should also be seen in the next decade (U.S. Department of Agriculture, Forest Service Air Program 2013).

3.3.1.6 *Greenhouse Gases and Climate Change*

Climate change is a global issue that results from several factors, including, but not limited to, the release of greenhouse gases (GHGs), land use management practices, and the albedo effect, or reflectivity of various surfaces (including reflectivity of clouds). The climate in the vicinity of the Proposed Action is summarized briefly here. Because of its elevation, Wyoming has a relatively cool climate. Above the 6,000-foot level, the temperature rarely exceeds 100 degrees Fahrenheit (°F). The warmest parts of the state are the lower portions of the Big Horn Basin, the lower elevations of the central and northeast portions of the state, and along the eastern border of the state (Water Resources Data System & State Climate Office 2023). The Project area has an average high temperature of 84°F in July and an average low temperature of 13°F in December and January (U.S. Climate Data 2023). Summer nights are almost invariably cool, even though daytime readings may be quite high at times. The state is considered semiarid east of the mountains. There are several mountain ranges, but the mountains themselves cover less area than the high plains. The Continental Divide splits the state from near the northwest corner to the center of the southern border. This leaves most of the drainage areas to the east. The runoff drains into three great river systems: the Columbia, the Colorado, and the Missouri. The average hourly wind speed in Rock Springs, Wyoming, experiences significant seasonal variation over the course of the year. The windier part of the year lasts for 7.8 months, from October 21 to June 15, with average wind speeds of more than 9.9 miles per hour. The windiest month of the year in Rock Springs is March, with an average hourly wind speed of 11.6 miles per hour. The calmer time of year lasts for 4.2 months, from June 15 to October 21. The calmest month of the year in Rock Springs is August, with an average hourly wind speed of 8.3 miles per hour. The predominant average hourly wind direction in Rock Springs is from the west

throughout the year. (Weatherspark 2023). The area has an average annual precipitation of 8.56 inches, with April and September being the wettest months by average precipitation (U.S. Climate Data 2023).

Climate is the composite of the generally prevailing weather conditions, such as temperature and precipitation, of a particular region throughout the year, averaged over a series of years. Climate change is the long-term (several decades or longer) alteration of atmospheric weather patterns (temperature, precipitation, winds, etc.), but changes could also occur in other parts of the climate system such as the hydrosphere (water), cryosphere (ice), biosphere (living organisms, ecosystems), or lithosphere (rock, soil, sand). One important way to track the causes and effects of climate change is through the use of indicators. Climate indicators show trends over time in key aspects of the environment. Many indicators are meteorologically related. Other indicators include GHGs, sea level, growing season length, ecosystems, and others.

Wyoming climate is determined by its inland location, distance from the equator, elevation, wide range of topography, and location with respect to storm paths across the western United States. Elevations range from 3,100 feet amsl in the southwest part of the state to 13,700 feet amsl in the Wind River Range Mountains. Mountain ranges in western United States also influence climate in Wyoming. Pacific storms must cross these ranges before reaching Wyoming, where much of the moisture in the storms falls as precipitation. Consequently, storms reaching Wyoming are relatively dryer and produce less precipitation (BLM 2023b).

The twenty-first century has been the warmest period on record for Wyoming, with a net warming of 1.4°F since the beginning of the twentieth century. Three of the four hottest years on record have occurred since 2012, with that year the hottest in the 126-year observational period. Temperature increases have been observed in all seasons. Since 1995, winter and summer temperatures have averaged 1.9°F and 1.2°F above the historical average, respectively. The state has experienced an above average frequency of very hot days (days with maximum temperature above 95°F) since 2000. Wyoming rarely experiences warm nights (nights with minimum temperatures above 70°F), but the early part of the twenty-first century has seen an above-average number of such nights. In addition to the overall trend of higher average temperatures, the state has experienced a below average number of very cold days (days with maximum temperatures below 0°F) since 2000 (BLM 2021). The Wyoming BLM 2023 Air Resources Monitoring Report (BLM 2023b) contains general background information on climate change and specific climate model projections for the State of Wyoming. Climate projections under a higher emissions scenario (Representative Concentration Pathway 8.5 [RCP8.5]) indicate that Wyoming could warm by as much as 15°F above current levels by the end of the century, though the mean increase for the state is about 10°F hotter than recent temperatures. According to the researchers who developed it, RCP8.5 was intended to be a very high baseline emission scenario representing the 90th percentile of no-policy baseline scenarios available at the time. More than 90% of the other no-policy baseline scenarios in the literature result in lower emissions. Under a lower emissions scenario, warming is projected to be about 2°F to 5°F above the 1991–2020 mean. Increases in average temperatures will be accompanied by increases in heat wave intensity and decreases in cold wave intensity (BLM 2023b).

There is no long-term trend in statewide annual mean precipitation, though 2012 was the driest year on record and 2020 the fifth driest on record. The driest multiyear periods were in the 1930s, 1950s, and 2000s, and the wettest in the 1940s and 1990s. The driest 5-year period was from 1931 to 1935, and the wettest was from 1995 to 1999. Unlike many other areas of the western United States, April 1 snowpack has remained relatively constant over the past 40 years. The median statewide April 1 snowpack between 1981 and 2000 is the same as that observed during the most recent 10-year period (2011–2020) (BLM 2021).

Climate models are not consistent in their projections of precipitation for Wyoming, including winter precipitation. However, projected rising temperatures will increase the average lowest elevation at which snow falls (the snow line). Continuing recent trends, this will increase the likelihood that precipitation will fall as rain instead of snow, reducing water storage in the snowpack, particularly at lower elevations that are currently on the margins of reliable snowpack accumulation. In addition, extreme precipitation is projected to increase, potentially increasing the frequency and intensity of floods (BLM 2023b).

Droughts, a natural part of Wyoming's climate, are expected to become more intense. Higher temperatures will amplify the effects of naturally occurring dry spells by increasing the rate of loss of soil moisture. Most of Wyoming's water is supplied by the snowpack, and changes to the snow/rain ratio could result in less water storage. Additionally, higher spring temperatures can cause early melting of the snowpack and decrease water availability during the already dry summer months. The projected increase in the intensity of naturally occurring droughts will increase the occurrence and severity of wildfires (BLM 2023b).

Specific to the Proposed Action, GHGs are produced and emitted by various sources during the development, operational, and reclamation phases of the Project. The primary GHGs associated with mining are carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) which result from fuel combustion in construction and maintenance vehicles and equipment.

Estimates of GHG emissions are usually reported in terms of CO₂e to account for the relative global warming potential (GWP) (i.e., a given pollutant's ability to trap heat). GWP is calculated over a specific time, typically 100 years. GHG emissions are typically quantified in units of CO₂e, in MTs. Table 3.3-5 provides background GHG emissions. The most recently available data on GHG emissions from EPA's annual Inventory of U.S. Greenhouse Gas Emissions and Sinks indicate that annual GHG emissions in 2021 in the United States were an estimated 5,586.0 million MTs after accounting for sequestration (EPA 2023f). Individually, in 2021, 52.2 million MTs of GHG were emitted in Wyoming. The EPA recognizes that there will be differences between the EPA's state-level GHG estimates and some inventory estimates developed independently by state governments, as EPA GHG reporting is only required for facilities above the 25,000 MT CO₂e reporting threshold.

Table 3.3-5. State and National Greenhouse Gas Emissions (million metric tons carbon dioxide equivalent per year)

Emission Source	Wyoming*	United States†
Emission inventories	52.2	5,586

* EPA (2023g). Data for 2021 emissions.

† EPA (2023f). Data for 2021 emissions.

3.3.2 Environmental Consequences

3.3.2.1 Analysis Method

Air quality impacts were determined based on the results of the near-field and far-field dispersion modeling runs and compared to the NAAQS/WAAQS, as well as established AQRV thresholds. The near-field assessment was focused on the evaluation of impacts (pollutant concentration) within 50 km from the center of the Project. The far-field impact assessment included criteria pollutants and AQRVs. The far-field modeling was focused on the evaluation of cumulative impacts (pollutant concentration, visibility, and acid deposition impacts) that extend beyond the 50-km domain and included Class I and Class II areas selected for this analysis. Additionally, a HAP impact assessment was performed for

benzene, toluene, ethylbenzene, xylenes (collectively referred to as BTEX), n-hexane, formaldehyde, and acetaldehyde. Finally, an AQRV analysis was also performed to assess changes in visibility and atmospheric deposition at Class I areas and requested Class II areas within and beyond the 50-km domain, including but not limited to Flaming Gorge National Recreation Area, Bridger Wilderness, Fitzpatrick Wilderness, Flat Tops Wilderness, Mount Zirkel Wilderness, Grand Teton National Park, Washakie Wilderness, Teton Wilderness, Arches National Park, Fossil Butte National Monument, and Dinosaur National Monument. Figure 3.3-1 (Appendix Q) shows a comparison of the Project location to the Class I and Class II areas of interest included in the modeling runs.

For all criteria pollutants, the AERMOD results were added to an ambient background concentration and compared with the applicable AAQS. For HAPs, the AERMOD results were compared to RELs, RfCs, and cancer risk thresholds. To determine whether the Project would result in an impact due to nitrogen and sulfur deposition, the Federal Land Managers' (FLM's) Interagency Guidance for Near Field Deposition Modeling (USFS, NPS, and USFWS 2014) was followed for Class II areas of interest within 50 km of the Project (i.e., Flaming Gorge National Recreation Area). Level 2 analysis was completed to assess deposition impacts from the Project. The modeling scenario used for the NAAQS evaluation would be used for the deposition analysis. The plume visual impact screening model VISCREEN was used to assess visibility impacts, per the FLM Air Quality Related Values Work Group Guidance Document (USFS, NPS, and USFWS 2010). VISCREEN assesses whether a plume from a source is visible to the typical person against the sky or a terrain feature. If a screening analysis of a new or modified source can demonstrate that its emissions would not cause a plume with any hourly estimates of color difference index greater than or equal to 2.0, or the absolute value of the plume contrast is greater than or equal to 0.05, then it can be assumed that the plume would not have a significant impact on visibility.

At the request of the BLM, a revised near-field modeling assessment was developed with input from the Wyoming DEQ, BLM, and other cooperating agencies, including the EPA and USFS to accurately estimate maximum potential impacts of criteria pollutants and HAPs from Project-related emission sources. The need for modeling refinements was based on evaluation of the original near-field modeling assessment, which revealed predicted exceedances of the NAAQS particularly modeled violations of the 1-hour NO₂ air quality standard. Based on the initial modeling assessment, the BLM determined a need to review and refine the modeling approach and source emission rates. The revised modeling assessment was conducted following the Technical Memorandum: Dry Creek Trona Project – NEPA Near-Field Modeling Refinements dated February 29, 2024 (included in Appendix K). The purpose of the technical memorandum was to identify and incorporate refinements to the model input source parameters and air pollutant modeling methods after review and consultation with the cooperating agency workgroup on February 14, 2024.

For the far-field modeling assessment, CALPUFF was used for long-range transport between 50 and 300 km from the source and for Class I area analyses. Using CALPUFF is consistent with the recommendations by the Federal Land Managers' AQRV Workgroup and the Interagency Workgroup on Air Quality Modeling. The far-field modeling was conducted in accordance with procedures in the FLAG 2010 guidance document using CALPUFF version 5.8.5. CALPUFF is still permitted for use in Class I and Class II area AQRV studies by FLMs, despite no longer being on the list of the EPA-preferred models in 40 CFR 51, Appendix W. This modeling effort would span a 600 × 600-km modeling domain centered at the Project to include the Class I areas within 300 km (i.e., Bridger Wilderness, Fitzpatrick Wilderness, Flat Tops Wilderness, Mount Zirkel Wilderness, Grand Teton National Park, Washakie Wilderness, Teton Wilderness, and Arches National Park) and the Class II area of Dinosaur National Monument. The near-field modeling report is included for reference as Appendix K and the far-field modeling report is included as Appendix L.

The incremental contribution to global GHGs from a proposed land management action cannot be accurately translated into effects on climate change globally or in the analysis area of any site-specific action. As a consequence, an assessment of effects of the Proposed Action and other alternatives on a global or even regional level cannot be performed. However, it is possible to analyze the incremental contribution of the Proposed Action and other alternatives in terms of ongoing GHG emissions, which contribute to global climatic impacts. GHG emissions are displayed as equivalencies for all alternatives to aid in understanding the entire impact of the Project in both the short and long term.

NEPA does not require an agency to quantify project impacts through a specific methodology, such as estimating the “social cost of carbon,” “social cost of methane,” or “social cost of greenhouse gases.” A protocol to estimate what is referenced as the “social cost of carbon” (SCC) associated with GHG emissions was developed by a federal Interagency Working Group on the Social Cost of Greenhouse Gases (IWG).

Executive Order 14154, *Unleashing American Energy* (Jan. 20, 2025), disbanded the IWG and withdrew any guidance, instruction, recommendation, or document issued by the IWG. Section 6(c) of Executive Order 14154 states:

The calculation of the “social cost of carbon” is marked by logical deficiencies, a poor basis in empirical science, politicization, and the absence of a foundation in legislation. Its abuse arbitrarily slows regulatory decisions and, by rendering the United States economy internationally uncompetitive, encourages a greater human impact on the environment by affording less efficient foreign energy producers a greater share of the global energy and natural resource market. Consequently, within 60 days of the date of this order, the Administrator of the EPA shall issue guidance to address these harmful and detrimental inadequacies, including consideration of eliminating the “social cost of carbon” calculation from any Federal permitting or regulatory decision.

Executive Order 14154 further directs agencies to ensure consistency with the guidance in OMB Circular A-4 of September 17, 2003, when estimating the value of changes in greenhouse gas emissions from agency actions.

The BLM has removed estimates for the SCC for this project for multiple reasons. First, this action is not a rulemaking. Rulemakings are the administrative actions for which the IWG originally developed the SCC protocol. Second, Executive Order 14154 clarifies that the IWG has been disbanded and its guidance has been withdrawn.

Further, NEPA does not require agencies to conduct a cost-benefit analysis. Including an SCC analysis without a complete cost-benefit analysis, which would include the social benefits of the proposed action to society as a whole and other potential positive benefits, would be unbalanced, potentially inaccurate, and not useful to foster informed decision-making. Any increased economic activity—in terms of revenue, employment, labor income, total value added, and output—that is expected to occur as a result of the proposed action is simply an economic impact, not an economic benefit, inasmuch as any such impacts might be viewed by another person as a negative or undesirable impact due to a potential increase in the local population, competition for jobs, and concerns that changes in population will change the quality of the local community. “Economic impact” is distinct from “economic benefit,” as understood in economic theory and methodology, and the socioeconomic impact analysis required under NEPA is distinct from a cost-benefit analysis, which NEPA does not require. In addition, many benefits and costs from agency actions cannot be monetized and, even if monetizable, cannot meaningfully be compared directly to SCC calculations for a number of reasons, including because of differences in scale (local impacts versus global impacts).

Finally, purported estimates of SCC would not measure the actual environmental impacts of a proposed action and may not accurately reflect the effects of GHG emissions. Estimates of SCC attempt to identify economic damages associated with an increase in carbon dioxide emissions—typically expressed as a one metric ton increase in a single year—and typically includes, but is not limited to, potential changes in net agricultural productivity, human health, and property damages from increased flood risk over hundreds of years. The estimate is developed by aggregating results across models, over time, across regions and impact categories, and across multiple scenarios. The dollar cost figure arrived at based on consideration of SCC represents the value of damages avoided if, ultimately, there is no increase in carbon emissions. But SCC estimates are often expressed in an extremely wide range of dollar figures, depending on the particular discount rates used for each estimate, and would provide little benefit in informing the Bureau's decision. For these reasons, the Department of the Interior has also rescinded its memorandum of October 16, 2024, entitled, "Updated Estimates of the Social Cost of Greenhouse Gases," which had directed Interior bureaus to calculate SCC using the methodology contained in the Environmental Protection Agency's Final Rule of March 8, 2024, 89 Fed. Reg. 16,820.

To summarize, the BLM is not evaluating SCC for this project because: (1) the BLM is not engaged in a rulemaking for which the now-rescinded SCC protocol was originally developed; (2) the IWG has been disbanded and all technical supporting documents and associated guidance have been withdrawn; (3) NEPA does not require agencies to prepare SCC estimates or cost-benefit analyses; (4) costs attributed to GHGs are often so variable and uncertain that they are unhelpful for the BLM's analysis; and (5) the full social benefits of carbon-based energy production have not been monetized, and quantifying only the costs of GHG emissions, but not the benefits, would yield information that is both potentially inaccurate and not useful.

3.3.2.2 *Alternative A (No Action)*

Under the No Action Alternative, the Proposed Action would not be constructed, operated, or decommissioned. The analysis area would exist under current authorizations and land uses. Therefore, impacts to air quality or GHG/climate change associated with the development of the Proposed Action would not occur. Under the No Action Alternative, other mining projects may be constructed, and those projects may have similar impacts in other locations.

3.3.2.3 *Alternative B (Proposed Action)*

The Proposed Action would develop well fields over 17 years with additional access roads, production facilities, and support facilities. The anticipated life of the Project is estimated to be 34 years, consistent with the February 2022 Mine Plan update (Appendix C). The Proposed Action includes the construction of new well fields, construction of new production facilities (i.e., north processing facility, south processing facility, and co-generation Facility), construction of access roads, rail lines, new pipeline gathering lines, transmission lines, and landfill. The primary pollutants of concern relative to construction emissions are PM₁₀ and PM_{2.5} from surface-disturbing activities, wind erosion of disturbed surfaces, and vehicle traffic on unpaved roads. In addition, CO and NO_x emissions from the operation of temporary power generators and off-road mobile equipment operations would also be emitted during construction activities. Emissions of criteria pollutants and HAPs would also result from the transportation of equipment and personnel to construction sites and the operation of construction equipment. The detailed emission inventories for the Project's construction, operational, and reclamation phases is included as an attachment to the *Dry Creek Trona Mine Project NEPA Air Quality Modeling Report* (Appendix K, Attachment 1). This inventory accounts for direct and indirect emissions, including fugitive and mobile sources of emissions, during the construction of facilities in Sections 22 and 27 and the rail line and access road.

The emissions calculations for the Project are dependent on estimates of the number of wells developed per year and the number of wells in production. The maximum annual emissions due to the Project are estimated to occur during year 8 (Y8) through year 10 (Y10) of the Project progression. This period assumes operations at the mine site, processing facilities, and well field Sections 25 and 26, alongside well field development occurring in Sections 23 and 24. The Proposed Action would develop well fields over 17 years with additional access roads, production facilities, and support facilities. The anticipated life of the Project is estimated to be 34 years, consistent with the Mine Plan (Appendix C).

The maximum estimated annual emissions for the Proposed Action are provided in Table 3.3-6. Detailed information on the emissions inventory is included in Appendix K, in Section 2.1.1 and Attachment 1.

Table 3.3-6. Proposed Action: Maximum Estimated Annual Emission Totals (Y8–Y10)

Emission Source	CO (tpy)	NO _x (tpy)	SO ₂ (tpy)	VOC (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	HAPs (tpy)	CO _{2e} (MTpy)
Operations point and fugitive sources	614	734	32	80	400	380	17	3,485,571
Operations mobile and portable sources	955	987	3	100	32	31	100	285,927
Well field development fugitive sources	0	0	0	0	94	10	0	0
Well field development mobile and portable sources	523	852	1	66	35	35	1	93,199
Mine site operations	2	3	<1	<1	3	<1	<1	15,536
Total	2,094	2,575	35	246	564	456	117	3,880,233

Source: Appendix K, Section 2.1.1.

Note: Pollutant emissions are expressed in tons per year (tpy), except for CO_{2e} which is expressed in MTs per year (MTpy).

May not sum to total due to rounding.

Near-Field Modeling Results

The modeled near-field Project impacts were added to background concentrations of the criteria pollutants to calculate total ambient air quality impacts. Pollutant concentrations were compared to the applicable NAAQS and WAAQS, collectively referred to as AAQS, to determine if emissions from the proposed Project could have a significant impact on existing air quality.

For all criteria pollutants (except O₃ and lead), the AERMOD results were added to an ambient background value and compared with the applicable AAQS. The modeling results indicate that the Project would result in increases in criteria pollutants and HAPs. Multiple scenarios were modeled, and the maximum modeled concentrations are displayed in Table 3.3-7 below. While the maximum ambient concentrations using the maximum modeled concentrations are approaching the levels of the NAAQS and WAAQS, these increases do not result in concentrations greater than the NAAQS for any criteria pollutant for the Proposed Action. Modeling results and a comparison to NAAQS/WAAQS are displayed in Table 3.3-7.

Table 3.3-7. Proposed Action: National Ambient Air Quality Standards/Wyoming Ambient Air Quality Standards Analysis Summary

Pollutant	Averaging Period	Maximum Modeled Concentration (µg/m ³)*	Background Concentration (µg/m ³)	Maximum Ambient Concentration (µg/m ³)	NAAQS/WAAQS (µg/m ³)	Modeled Concentration Below NAAQS
CO	1-hour [†]	625.3	933.6	1,559.0	40,000	Yes
	8-hour [†]	217.4	801.9	1,019.3	10,000	Yes

Pollutant	Averaging Period	Maximum Modeled Concentration (µg/m³)*	Background Concentration (µg/m³)	Maximum Ambient Concentration (µg/m³)	NAAQS/WAAQS (µg/m³)	Modeled Concentration Below NAAQS
NO ₂	1-hour [†]	141.8**	30.6	172.4	188	Yes
	Annual	33.3	2.4	35.7	100	Yes
PM ₁₀	24-hour [§]	91.2	47.7	138.9	150	Yes
	Annual	19.2	7.8	27.0	50	Yes
PM _{2.5}	24-hour [¶]	8.9	18.0	26.9	35	Yes
	Annual	3.5	5.2	8.7	9	Yes
SO ₂	1-hour [#]	0.6	21.6	22.2	195	Yes
	3-hour [†]	0.5	25.0	25.5	1,300	Yes

* The Maximum Modeled Concentration represents the highest of two scenarios modeled. See Appendix K, Section 4.2.1 for more details.

[†] Represents the high 2nd high concentration.

[‡] Represents the 98th percentile concentration over a 5-year period.

[§] Represents the 6th highest concentration over a 5-year period.

[¶] Represents the average of the 8th highest 24-hour concentrations over a 5-year period.

[#] Represents the 99th percentile concentration over a 5-year period.

** Modeled using Tier 3 NO_x to NO₂ Ozone Limiting Method.

The modeling results indicate that although the Project is associated with increases in criteria pollutants, these increments would not lead to concentrations exceeding the NAAQS or WAAQS for NO₂, CO, SO₂, PM₁₀, and PM_{2.5} under the Proposed Action.

Hazardous Air Pollutants Modeling Results

The HAP impact assessment included the comparison of the modeled HAPs concentrations against RELs and RfCs. Results from the HAP modeling for the Proposed Action are shown in Table 3.3-8.

Table 3.3-8. Proposed Action: Hazardous Air Pollutant Reference Exposure Levels and Reference Concentrations

Pollutant/HAP	REL (µg/m³)	RfC* (µg/m³)	Modeled 1-hour Concentration (µg/m³)	Modeled Annual Concentration (µg/m³)	Complies with REL and/or RfC
Formaldehyde	55 [†]	9.8	14.2	0.259	Yes
Acetaldehyde	470 [†]	9	5.09	0.095	Yes
Benzene	27 [†]	30	8.09	0.095	Yes
Toluene	7,500 [‡]	5,000	3.29	0.040	Yes
Ethylbenzene	22,000 [‡]	1,000	0.21	0.006	Yes
Xylenes	8,700 [‡]	100	2.33	0.028	Yes
n-Hexane	180,000 [§]	700	1.04	0.007	Yes

Source: Appendix K, Section 4.2.3.

Note: N/A = not available.

* Regional Screening Level Resident Ambient Air Table May 2022 (<https://semspub.epa.gov/work/HQ/402381.pdf>).

[†] California EPA REL for no adverse effects. Table 2. Acute Dose-Response Values for Screening Risk Assessments (EPA 2021a).

[‡] Agency for Toxic Substances and Disease Registry minimal risk levels for no adverse effects for 1 to 14-day exposures. Table 2. Acute Dose-Response Values for Screening Risk Assessments (EPA 2021a).

[§] Values referenced from National Institute for Occupational Safety and Health REL.

For carcinogenic HAPs (benzene, ethylbenzene, and formaldehyde), cancer risks were calculated and assessed against the significance criterion of one additional cancer per one million exposed persons (1×10^{-6}). The results of those analyses are shown in Table 3.3-9.

Table 3.3-9. Proposed Action: Hazardous Air Pollutant Lifetime Cancer Risk Analysis

Pollutant/HAP	Inhalation Unit Risk* ($1/\mu\text{g}/\text{m}^3$)	Maximum Modeled Concentration ($\mu\text{g}/\text{m}^3$) [†]	MEI Lifetime Cancer Risk	MLE Lifetime Cancer Risk
Formaldehyde	0.000013	0.30	3.30E-06	3.65E-07
Acetaldehyde	0.0000022	0.11	2.06E-07	2.27E-08
Benzene	0.0000078	0.058	3.89E-07	4.29E-08
Toluene	–	0.041	–	–
Ethylbenzene	0.0000025	0.006	1.29E-08	1.43E-09
Xylenes	N/A	0.024	–	–
n-Hexane	N/A	0.0076	–	–
Total cancer risk			3.91E-06	4.32E-07

Source: Appendix K, Section 4.2.3.

Notes: MEI = maximally exposed individual; MLE = most likely exposure; N/A = not available.

* Integrated Risk Information System.

[†] The Maximum Modeled Concentration represents the highest of two scenarios modeled. See Appendix K for more detail.

For the maximum exposed individual (MEI) risk, it is assumed that a person is exposed continuously (24 hours per day, 365 days per year) for the life of project. For the most likely exposure (MLE) risk, an adjustment was made for the amount of time a family stays at a residence (9 years) and for the portion of time spent away from the home (64% of the day) (EPA 1997). It is further assumed that households are exposed to one-quarter of the maximum concentration the remaining (36%) of the time. Exposure adjustment factors of 0.86 for the MEI (60/70) and 0.095 for the MLE $[(9/70)*((0.64*1)+(0.36*0.25))]$ are applied to the estimated cancer risk to account for the actual time that an individual could be exposed during a 70-year lifetime.

The MEI's long-term risk for acetaldehyde, benzene, and ethylbenzene is less than 1×10^{-6} . Similarly, the MLE risk for all analyzed pollutants also stays below this figure. In contrast, risks associated with formaldehyde for the MEI surpass 1×10^{-6} , but are less than 1×10^{-4} . When the MLE risks from benzene, acetaldehyde, ethylbenzene, and formaldehyde are combined, they remain beneath the 1×10^{-6} threshold.

The findings suggest a potential increased cancer risk in the MEI assessment. A total cancer risk of 3.91×10^{-6} was estimated for the MEI case. It is crucial to emphasize that the projected maximum concentrations and risk increments are very localized. For a cancer risk lower than one-in-one million over a 70-year MEI exposure, the distance is estimated to be 350 meters (m) away from western property boundary. An isopleth showing the extents of the predicted exceedances is presented on Figure 3.3-2 (Appendix Q).

Requested Class II – Flaming Gorge National Recreation Area

For requested Class II areas of interest within 50 km of the Project (i.e., Flaming Gorge NRA), the FLM Interagency Guidance for Near Field Deposition Modeling (USFS, NPS, and USFWS 2014) was followed to determine whether the Project would result in impacts to nitrogen and sulfur deposition above established thresholds. Level 2 analysis was completed to show deposition impacts from the Project.

Similar to the NAAQS/WAAQS analysis presented above, dispersion modeling was performed to predict the ambient air impacts in the Flaming Gorge NRA Class II area. The results of the dispersion modeling and a comparison to the AAQS are displayed in Table 3.3-10.

Table 3.3-10. Proposed Action: Flaming Gorge National Recreation Area Class II National Ambient Air Quality Standards/Wyoming Ambient Air Quality Standards Analysis Summary

Pollutant	Averaging Period	Maximum Modeled Concentration ($\mu\text{g}/\text{m}^3$)*	Background Concentration ($\mu\text{g}/\text{m}^3$)	Maximum Ambient Concentration ($\mu\text{g}/\text{m}^3$)	NAAQS/WAAQS ($\mu\text{g}/\text{m}^3$)	Modeled Concentration Below NAAQS
CO	1-hour [†]	109.16	933.6	1,042.76	40,000	Yes
	8-hour [†]	18.16	801.9	820.06	10,000	Yes
NO ₂	1-hour [‡]	59.05	30.6	89.7	188	Yes
	Annual	1.05	2.4	3.45	100	Yes
PM ₁₀	24-hour [§]	3.29	47.7	50.99	150	Yes
	Annual	0.46	7.8	8.26	50	Yes
PM _{2.5}	24-hour [¶]	0.81	18.0	18.81	35	Yes
	Annual	0.22	5.2	5.42	9	Yes
SO ₂	1-hour [#]	0.15	21.6	21.75	195	Yes
	3-hour [†]	0.14	25.0	25.14	1,300	Yes

Source: Appendix K, Section 4.2.2.

* The Maximum Modeled Concentration represents the highest of two scenarios modeled. See Appendix K for more detail.

[†] Represents the high 2nd high concentration.

[‡] Represents the 98th percentile concentration over a 5-year period.

[§] Represents the 6th highest concentration over a 5-year period.

[¶] Represents the average of the 8th highest 24-hour concentrations over a 5-year period.

[#] Represents the 99th percentile concentration over a 5-year period.

The impacts predicted by dispersion modeling when added to the representative background concentrations are below the respective standards for all pollutants and averaging periods at the Flaming Gorge NRA Class II area.

Dry deposition modeling was performed to assess the atmospheric deposition of sulfur and nitrogen at the Flaming Gorge NRA Class II area. The modeled result is compared to a corresponding deposition analysis threshold (DAT). If the modeled result does not exceed the DAT, the source's impacts are presumed to be negligible. The results of those analyses are presented in Table 3.3-11.

Table 3.3-11. Proposed Action: Flaming Gorge National Recreation Area Class II Deposition Analysis Impacts

Pollutant	Maximum Dry Deposition (g/m^3)*	HNO ₃ /NO ₂ Ratio	Molecular Weight Ratio	Project Dry Deposition ($\text{kg}/\text{ha}/\text{yr}$)	DAT ($\text{kg}/\text{ha}/\text{yr}$)	Project Deposition Below DAT
NO ₂	0.00008	1.37	0.22	0.000009	0.005	Yes
SO ₂	0.00002	—	0.5	0.000010	0.005	Yes

Source: Appendix K, Section 4.2.2.

Notes: HNO₃ = Nitric acid

* The Maximum Dry Deposition represents the highest of two scenarios modeled. See Appendix K for more detail.

For the Flaming Gorge NRA, maximum impacts were compared against the DAT of 0.005 kg/ha/yr. The findings show that the maximum deposition in the analyzed region for both sulfur and nitrogen fall below the DAT.

A Level-1 VISCREEN analysis was performed to evaluate pollutant color and contrast, assuming the worst possible dispersion condition (combination of wind speed and stability class) regardless of actual meteorology at the site. If visibility criteria in the model are not exceeded, the analysis is complete, and the Project is not likely to have a significant impact on visibility.

The VISCREEN output includes a comparison of two calculated parameters with criteria thresholds to determine the possibility of plume perceptibility by an observer. The two parameters are contrast (C_p) and color contrast or plume perceptibility (ΔE). Contrast is a measure of the difference in the light intensity without regard for color. Color contrast measures the difference in wavelength of light rather than intensity. VISCREEN reports results for both C_p and ΔE for a plume against a backdrop of both sky and terrain and with solar angles (θ) of 10 degrees and 140 degrees. Any result that exceeds the threshold for either C_p or ΔE indicates a visible plume. Note that VISCREEN does not differentiate between daytime and nighttime hours, and it always assumes there is solar illumination of the plume.

The results for the Level 1 screening analysis showed exceedances of the Class I screening criteria (2.0 for color difference index and 0.05 for contrast). Because the values were exceeded, a Level 2 analysis was required.

The results for the Level 2 screening analysis showed exceedances of the Class I screening criteria (2.0 for color difference index and 0.05 for contrast) for the forward scattering case leading to the brightest plume (i.e., Theta of 10 degrees when the sun is in front of the observer). However, no predicted exceedances were identified for the backward scattering case leading to the darkest plume (i.e., Theta of 140 degrees when the sun is behind the observer). This analysis is considered conservative, as many of the emissions would be generated during daytime hours, and the emission sources are scattered throughout the mine site, which would result in more dispersed emissions than predicted by the model.

The nearest Class I area is Bridger Wilderness, which is located 150 km north of the Project. Because there are no Class I areas located within the maximum range of the VISCREEN model (50 km), there are no criteria available to assess visibility. Therefore, the Class II visibility analysis is for informational purposes, as there is no established criterion for Class II areas.

Far-Field Modeling Results

Concentrations

This subsection presents the Proposed Action (Alternative B) CALPUFF concentration predictions at the Class I and Class II areas, as well as their respective Significant Impact Levels (SILs) for comparison purposes. PSD increments are also shown for reference only. The results of those analyses are presented in Table 3.3-12 below.

For the Class I areas, the SO_2 and NO_2 impacts are all well below the respective SILs. The 3-hour and 24-hour SO_2 impacts are highest at Bridger, Flat Tops, and Mount Zirkel Wilderness Areas. Both SO_2 and NO_2 annual-average impacts are highest at Mount Zirkel Wilderness. This is consistent with the prevailing wind directions from west-northwest. Modeled $PM_{2.5}$ concentrations are below the 24-hour and annual SILs for all years for all Class I areas. Modeled PM_{10} concentrations are below the 24-hour and annual SILs for all years for all Class I areas.

For the Class II areas, the SO₂ and NO₂ impacts are all well below the respective SILs. The 3-hour and 24-hour SO₂ impacts are highest at Dinosaur National Monument. For PM_{2.5}, both Class II areas are below the 24-hour and annual SILs for all years. Similar to the PM_{2.5} results, the PM₁₀ impacts at both Class II areas are below the 24-hour and annual SILs for all years.

Visibility

This subsection presents visibility results for the Class I and Class II areas in terms of the number of days greater than 0.5 dv, and the 98th percentile impact (in deciviews). Table 3.3-13 presents the number of exceeding days and the 98th percentile deciview impacts.

For Class I areas, the highest visibility impacts occur at Bridger Wilderness. There are no exceedance days for any Class I areas except for Bridger Wilderness, which had only 1 day in year 2020 exceeding 0.5 dv. There are no instances of the 98th percentile impact exceeding the 0.5-dv threshold value at any Class I area for any of the modeled years. Both analyzed Class II areas exceed the 0.5-dv thresholds on some days for all years. The 98th percentile impacts are greater than 0.5 dv for Dinosaur National Monument for years 2019 and 2020, while for Fossil Butte National Monument, the 98th percentile impacts do not exceed 0.5 dv for any of the modeled years.

Deposition

This subsection presents the Proposed Action (Alternative B) CALPUFF concentration predictions at the Class I and II areas as well as their respective SILs for comparison purposes and PSD increments for reference only. The results of those analyses are presented in Table 3.3-14 below.

There are no exceedances of the 0.005 kilograms per hour per year (kg/hour/yr) DAT for either sulfur or nitrogen at any Class I area for any of the modeled years. For Class II areas, there are no exceedances of the 0.005 kg/hour/yr DAT for sulfur for any year. The nitrogen DAT is exceeded for years 2019 and 2020 at Dinosaur National Monument. For Fossil Butte National Monument, the nitrogen DAT is not exceeded for any of the modeled years. It is important to note that the DAT does not represent a level of significance that would require mitigation if Project-only deposition levels exceed the DAT.

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Table 3.3-12. Proposed Action Class I and II Area Concentration Results – Far-Field Analysis Area

Pollutant	Averaging Time	SIL (µg/m³)	PSD Increment (µg/m³)	Class I Areas								SIL	PSD Increment	Class II Areas	
				Arches National Park	Bridger Wilderness	Fitzpatrick Wilderness	Flat Tops Wilderness	Grand Teton National Park	Mount Zirkel Wilderness	Teton Wilderness	Washakie Wilderness			Dinosaur National Monument	Fossil Butte National Monument
NO ₂	Annual	0.1	2.5	0.0006	0.0012	0.0004	0.0018	0.0002	0.0031	0.0002	0.0002	1	25	0.023	0.004
PM ₁₀	24 hour	0.32	8	0.03	0.18	0.05	0.10	0.03	0.07	0.02	0.01	5	30	1.3	0.12
	Annual	0.16	4	0.0012	0.0022	0.0009	0.0025	0.0005	0.0038	0.0004	0.0004	1	17	0.019	0.005
PM _{2.5}	24 hour	0.27	2	0.03	0.07	0.04	0.04	0.02	0.04	0.02	0.01	1.2	9	0.31	0.10
	Annual	0.05	1	0.001	0.0015	0.0008	0.0019	0.0004	0.0031	0.0003	0.0003	0.2	4	0.013	0.004
SO ₂	3 hour	1	25	0.0014	0.0024	0.0013	0.002	0.0011	0.0026	0.0012	0.0011	25	512	0.01	0.01
	24 hour	0.2	5	0.0005	0.001	0.0005	0.0007	0.0004	0.0007	0.0003	0.0003	5	91	0.003	0.002
	Annual	0.1	2	0.00002	0.00003	0.00001	0.00003	0.00001	0.00005	0.00001	0.00001	1	20	0.00027	0.00009

Source: Appendix L, Sections 4.2 and 4.5. Data from 2019 to 2021 was analyzed, but the table above displays the highest value between the 3 years.

Table 3.3-13. Proposed Action Class I and II Area Visibility Results – Far-Field Analysis Area

Class I and Class II Areas		Number of Days > 0.5 dv 24-hour			Number of Days > 1.0 dv 24-hour		
		2019	2020	2021	2019	2020	2021
Class I Area	Arches National Park	0	0	0	0	0	0
	Bridger Wilderness	0	1	0	0	0	0
	Fitzpatrick Wilderness	0	0	0	0	0	0
	Flat Tops Wilderness	0	0	0	0	0	0
	Grand Teton National Park	0	0	0	0	0	0
	Mount Zirkel Wilderness	0	0	0	0	0	0
	Teton Wilderness	0	0	0	0	0	0
	Washakie Wilderness	0	0	0	0	0	0
Class II Area	Dinosaur National Monument	18	9	5	2	4	1
	Fossil Butte National Monument	5	2	3	0	0	0

Source: Appendix L, Sections 4.3 and 4.6.

Table 3.3-14. Proposed Action Class I and II Area Deposition Results – Far-Field Analysis Area

Constituent	DAT Values (kg/ha-year)	Class I Areas								Class II Areas	
		Arches National Park	Bridger Wilderness	Fitzpatrick Wilderness	Flat Tops Wilderness	Grand Teton National Park	Mount Zirkel Wilderness	Teton Wilderness	Washakie Wilderness	Dinosaur National Monument	Fossil Butte National Monument
Sulfur	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrogen	0.005	<0.001	0.002	0.002	0.002	<0.001	0.002	<0.001	<0.001	0.006*	0.003

Source: Appendix L, Sections 4.4 and 4.7. Data from 2019 to 2021 was analyzed, but the table above displays the highest value between the 3 years.

* Value exceeds DAT threshold.

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Cumulative Far-Field Modeling Results

During the course of the modeling efforts for the Dry Creek Trona Mine Project, a separate trona development project called Project West was identified in the analysis area. The BLM subsequently obtained project emissions data for Project West, and these emissions have been added to assess cumulative impacts for the Proposed Action and Alternative D. American Soda, Southwest Wyoming Carbon Dioxide Sequestration, and Sweetwater Carbon Storage Hub project emissions are not publicly available at this time and therefore cannot be quantified in the Final EIS. Without quantified emissions, these projects cannot be incorporated into any dispersion modeling (near- or far-field). This revised CALPUFF analysis serves as the cumulative analysis for the Dry Creek EIS, incorporating emissions data from the updated RFFAs.

Concentrations

This subsection presents the Proposed Action and Project West cumulative impact CALPUFF modeled concentrations at the Class I areas, as well as their respective SILs for comparison purposes. PSD increments are also shown for reference only. The results of those analyses are presented in Table 3.3-15 below.

For the Class I areas, the SO₂ and NO₂ impacts are all well below the respective SILs. The 3-hour and 24-hour SO₂ impacts are highest at Bridger, Flat Tops, and Mount Zirkel Wilderness Areas. Both SO₂ and NO₂ annual-average impacts are highest at Mount Zirkel Wilderness. This is consistent with the prevailing wind directions from west-northwest. Modeled PM_{2.5} concentrations are below the 24-hour and annual SILs for all years for all Class I areas. Modeled PM₁₀ concentrations are below the 24-hour and annual SILs for all years for all Class I areas. Note that PSD increments and SIL are meant for individual projects only, and comparisons are shown for informational purposes only.

For the Class II areas, the SO₂ and NO₂ impacts are all well below the respective SILs. The 3-hour and 24-hour SO₂ impacts are highest at Dinosaur National Monument. For PM_{2.5}, both Class II areas are below the 24-hour and annual SILs for all years. Similar to the PM_{2.5} results, the PM₁₀ impacts at both Class II areas are below the 24-hour and annual SILs for all years.

Dry Creek is the dominant contributor to the NO₂ cumulative impact concentrations at all Class I areas for all years. For Class II areas, Dry Creek is the dominant contributor to most of the NO₂ cumulative impact concentrations, but Project West is the dominant contributor at Fossil Butte National Monument for years 2020 and 2021.

Dry Creek is the dominant contributor to the PM_{2.5} cumulative impact concentrations at all Class I and Class II areas for all years. Dry Creek is the dominant contributor to the PM₁₀ cumulative impact concentrations at all Class I and Class II areas for all years.

Visibility

This subsection presents cumulative impact visibility results for the Class I and Class II areas in terms of the number of days greater than 0.5 dv, and the 98th percentile impact (in deciviews). Table 3.3-16 presents the number of exceeding days and the 98th percentile deciview impacts.

For Class I areas, the highest visibility impacts occur at Bridger Wilderness. There is only one day exceeding 0.5 dv at Bridger, Fitzpatrick, Flat Tops, and Mount Zirkel Wilderness Areas. At other Class I areas, no days exceed 0.5 or 1.0 dv for any year. There are no instances of the 98th percentile impact exceeding the 0.5-dv threshold value at any Class I area for any of the modeled years. Both analyzed Class II areas exceed the 0.5-dv thresholds on some days for all years. The 98th percentile impacts are

greater than 0.5 dv for Dinosaur National Monument for years 2019 and 2020, and for year 2019 at Fossil Butte National Monument.

Dry Creek is the dominant contributor to the visibility 98th percentile cumulative impact results at all Class I and Class II areas for all years.

Deposition

This subsection presents the cumulative impact deposition results at the Class I and II areas. The results of those analyses are presented in Table 3.3-17 below.

While Dry Creek is the dominant contributor to the nitrogen deposition cumulative impact results at all Class I and Class II areas for all modeled years, there are no predictive exceedances of the critical loads for nitrogen or sulfur deposition at any Class I or Class II areas.

Table 3.3-15. Proposed Action and Project West Class I and II Area Concentration Results – Cumulative Far-Field Analysis Area

Pollutant	Averaging Time	SIL (µg/m³)	PSD Increment (µg/m³)	Class I Areas								SIL (µg/m³)	PSD Increment (µg/m³)	Class II Areas	
				Arches National Park	Bridger Wilderness	Fitzpatrick Wilderness	Flat Tops Wilderness	Grand Teton National Park	Mount Zirkel Wilderness	Teton Wilderness	Washakie Wilderness			Dinosaur National Monument	Fossil Butte National Monument
NO ₂	Annual	0.1	2.5	0.0009	0.0017	0.0007	0.0025	0.0004	0.0044	0.0003	0.0003	1	25	0.030	0.008
PM ₁₀	24 hour	0.32	8	0.04	0.18	0.06	0.11	0.03	0.07	0.03	0.02	5	30	1.43	0.17
	Annual	0.16	4	0.0015	0.0029	0.0013	0.0032	0.0007	0.0048	0.0005	0.0006	1	17	0.022	0.008
PM _{2.5}	24 hour	0.27	2	0.03	0.09	0.05	0.06	0.03	0.05	0.02	0.02	1.2	9	0.35	0.14
	Annual	0.05	1	0.0013	0.0021	0.001	0.0024	0.0006	0.0039	0.0005	0.0005	0.3	4	0.016	0.007
SO ₂	3 hour	1	25	0.0015	0.0033	0.0018	0.0025	0.0014	0.0033	0.0016	0.0015	25	512	0.01	0.01
	24 hour	0.2	5	0.0006	0.0011	0.0006	0.001	0.0006	0.001	0.0005	0.0004	5	91	0.004	0.003
	Annual	0.1	2	0.00002	0.00004	0.00002	0.00004	0.00001	0.00007	0.00001	0.00001	1	20	0.0003	0.0001

Source: Appendix L, Sections 7.2 and 7.5. Data from 2019 to 2021 was analyzed, but the table above displays the highest value between the 3 years.

Table 3.3-16. Proposed Action and Project West Class I and II Area Visibility Results – Cumulative Far-Field Analysis Area

Class I and Class II Areas		Number of Days > 0.5 dv 24-hour			Number of Days > 1.0 dv 24-hour		
		2019	2020	2021	2019	2020	2021
Class I Area	Arches National Park	0	0	0	0	0	0
	Bridger Wilderness	0	1	0	0	0	0
	Fitzpatrick Wilderness	0	1	0	0	0	0
	Flat Tops Wilderness	1	0	0	0	0	0
	Grand Teton National Park	0	0	0	0	0	0
	Mount Zirkel Wilderness	0	1	0	0	0	0
	Teton Wilderness	0	0	0	0	0	0
	Washakie Wilderness	0	0	0	0	0	0
Class II Area	Dinosaur National Monument	25*	17*	5	8*	4*	1
	Fossil Butte National Monument	13*	7	6	3*	1	3

Source: Appendix L, Sections 7.3 and 7.6.

* Values exceed visibility limits.

Table 3.3-17. Proposed Action and Project West Class I and II Area Deposition Results – Cumulative Far-Field Analysis Area

Constituent	Class I Areas								Class II Areas	
	Arches National Park	Bridger Wilderness	Fitzpatrick Wilderness	Flat Tops Wilderness	Grand Teton National Park	Mount Zirkel Wilderness	Teton Wilderness	Washakie Wilderness	Dinosaur National Monument	Fossil Butte National Monument
Critical Load for Nitrogen (kg/ha-yr)	3	3	3	4	4	4	4	3	3	3
Sulfur	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrogen	<0.001	0.003	0.002	0.003	0.001	0.004	0.001	0.001	0.009	0.005

Source: Appendix L, Sections 7.4 and 7.7. Data from 2019 to 2021 was analyzed, but the table above displays the highest value between the 3 years.

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Modeled Emission Rates for Precursors Modeling Results

The EPA issued a memorandum on April 30, 2024, that provided updated guidance on the methodology of using Modeled Emission Rates for Precursors (MERPs) as a Tier I demonstration tool for ozone and secondary PM_{2.5}. In accordance with this guidance, a MERPs analysis was performed for precursor pollutants related to O₃ and secondary PM_{2.5}. This demonstration tool provides a simplified and conservative method to relate maximum downwind impacts with a critical air quality threshold, such as the SIL or NAAQS.

The total Project emissions do not exceed the illustrative MERP values from the EPA MERP guidance for the daily or annual PM_{2.5} averaging periods. Therefore, the recommended SILs would not be exceeded when considering the combined impacts of the precursors. The 8-hour O₃ MERP value for NO_x was exceeded by the Project emissions. The SIL for O₃ is expected to be exceeded by the Project's emissions of precursors. Therefore, a NAAQS analysis was performed, and the results are provided in Table 3.3-18.

Table 3.3-18. Proposed Action: Ozone National Ambient Air Quality Standards Analysis

Precursor	Average	Hypothetical Source* (tpy)	Modeled Impact of Hypothetical Source* (ppb)	O ₃ - Project Contribution (ppb)
VOC	Annual	500	0.1646	0.08
NO _x	Annual	1,000	1.8069	4.65
Project O ₃ contribution				4.73
O ₃ background concentration†				62
Total 8-hour O ₃ concentration				66.73
8-hour O ₃ NAAQS				70.0

Source: Appendix K, Section 4.2.4.

* Data for Sweetwater County, Wyoming, from EPA MERPs View Qlik.

† Data from Hiawatha Green Site monitor for the years 2018–2020.

When the source impact is combined with the nearby monitor design value, the projected value is less than the level of the O₃ NAAQS.

The MERPs values for PM_{2.5} precursors were also used to predict the PM_{2.5} secondary contribution anticipated from the Project emissions. The results of the analysis are provided in Table 3.3-19.

Table 3.3-19. Proposed Action: Particulate Matter of 2.5 Microns or Less Secondary Contribution

Precursor	Average	Hypothetical Source* (tpy)	Modeled Impact of Hypothetical Source* (µg/m ³)	PM _{2.5} - Project Contribution (µg/m ³)
SO ₂	Annual	1,000	0.00657	0.00023
	24-hour	1,000	0.14600	0.00518
NO _x	Annual	1,000	0.00483	0.01243
	24-hour	1,000	0.05842	0.15043
24-hour PM _{2.5} secondary contribution				0.15561
Annual PM _{2.5} secondary contribution				0.01266

Source: Appendix K, Section 4.2.4.

* Data for Sweetwater County, Wyoming, from EPA MERPs View Qlik.

When the source impact is compared to the respective SIL, the 24-hour projected value for PM_{2.5} of 0.16 µg/m³ is below the PM_{2.5} SIL of 1.2 µg/m³. The annual PM_{2.5} projected value of 0.013 µg/m³ is below the PM_{2.5} recommended SIL of 0.13 µg/m³.

When assessing both primary and secondary PM_{2.5} impacts, the EPA recommends combining these impacts and then adding a representative background concentration for comparison against the NAAQS. Under the Proposed Action, the sum of the 24-hour secondary PM_{2.5} impact (0.16 µg/m³), the 24-hour direct PM_{2.5} impact (8.9 µg/m³), and the 24-hour PM_{2.5} background (18.0 µg/m³) is 27.1 µg/m³, which is below the 24-hour PM_{2.5} NAAQS of 35 µg/m³. The sum of the annual secondary PM_{2.5} impact (0.013 µg/m³), the annual direct PM_{2.5} impact (3.5 µg/m³), and the annual PM_{2.5} background (5.2 µg/m³) is 8.7 µg/m³ which is below the annual PM_{2.5} NAAQS of 9 µg/m³.

Greenhouse Gas and Climate Change

Well development (drill rig engines, mud pumps, generators, on-road mobile sources, off-road mobile sources, etc.), well reclamation, and operational activities (co-generation facility, lime kilns, on-road mobile sources, product transport, processing facilities venting, etc.) would result in GHG emissions from equipment exhaust and vehicle exhaust caused by travel to and from the Project area. Emissions from paved and unpaved road traffic would occur over a large area, resulting in negligible impacts at any given location.

The Green River Basin formation may contain pressurized methane, which poses significant risks to health, safety, emissions, and subsidence. If released, methane can create explosion hazards, suffocation risks, and contribute to climate change due to its potent greenhouse effect. Uncontrolled emissions would complicate environmental efforts and regulatory compliance. Additionally, methane extraction could lead to subsidence, causing surface instability and damage to infrastructure. Effective management and monitoring are crucial to mitigate these health, safety, and environmental impacts.

No methane release is expected at the well heads as this is a closed system until the brine solution enters the atmospheric storage tanks at the mine site. For the storage tanks, Pacific Soda calculated a total potential-to-emit of 84 tons per year of methane in the Mine Site Minor Source Permit (approved by Wyoming DEQ Air Quality Division in 2024). This projected emission volume was based on the measured emissions at Kazan Soda, which is considered to be conservative compared to the anticipated conditions in Sweetwater County. Tables 3.3-6 and 3.3-20 present the estimated maximum annual GHG emissions and the speciated annual GHG emissions that would occur during the life of the mine Project. Table 3.3-21 presents the estimated total GHG emissions over the entire Project life.

Table 3.3-20. Proposed Action: Maximum Annual Greenhouse Gas Totals

Emission Source	CO ₂ (MTpy)	CH ₄ (MTpy)	N ₂ O (MTpy)	CO ₂ e (MTpy)
Operations point and fugitive sources	3,468,169	139	47	3,485,571
Operations mobile and portable sources	284,151	18	4	285,927
Well field development mobile and portable sources	92,889	4	1	93,199
Mine site operations	283	610	0	15,536
Total	3,845,491	770	52	3,880,233

Notes: CO₂e is expressed in metric tons per year (MTpy). Totals may not sum to total due to rounding.

Table 3.3-21. Proposed Action: Project Lifetime Greenhouse Gas Total

Emission Source	CO ₂ (MT)	CH ₄ (MT)	N ₂ O (MT)	CO ₂ e (MT)
Project lifetime total	76,913,581	15,400	1,039	77,608,314

The Proposed Action would generate approximately 3,880,233 MT of CO₂e during the peak year of activity. This is equivalent to the GHG emissions from 923,503 gasoline-powered passenger vehicles driven for 1 year. It is also equivalent to the annual CO₂ emissions from approximately one coal-fired power plant in 1 year. Similarly, the Proposed Action would generate approximately 77,608,314 MT of CO₂e over the lifetime of the Project. The Proposed Action is the lowest GHG Alternative, with the exception of the No Action Alternative.

The majority of the emissions of GHGs is from the Operations Point and Fugitive Sources group, specifically from the Cogeneration Plant natural gas-fired turbines with HRSGs denoted “GT and HRSG” in the emissions inventory (Barr Engineering 2023), which alone would contribute 2,272,384 MTs per year (MTPy) CO₂e or 59% of the maximum annual GHG emissions for the Project.

The impacts of Proposed Action emissions would be low compared to the analysis area’s existing emissions (Table 3.3-5). Annual emissions from the Proposed Action represent 7.43% of the annual emissions for Wyoming or 0.07% of the annual emissions for the United States. Project GHG emissions comparisons are based on potential to emit and represent the highest possible CO₂e emissions, which have been compared to actual state and U.S. emissions. This is a conservative approach. Although the Project would be allowed to emit the maximum quantity of emissions allowed in its air permit, the Project would not always emit the maximum but a lesser amount to maintain compliance.

3.3.2.4 Alternative C

Alternative C would retain all Project components described in the Mine Plan for Alternative B except the overhead transmission line would be constructed along I 80 and extend south to be collocated with the rail line. Additionally, the access road would use an existing interchange on I 80 (Exit 61) and run along I 80 before turning south to be collocated with the rail line. This change would collocate the transmission line, access road, and rail line and thereby reduce construction through undisturbed areas. This change would also eliminate the need to construct road improvements (widening and intersection) at the intersection of U.S. Highway 30 (US 30) and the new access road. Long-term disturbance during the operation and maintenance phase of the Project that would be similar in nature as Alternative B with the introduction of additional miles of linear components as compared to Alternative B. This includes an additional 2.4 miles for the northern access road (an increase from 16.1 to 18.5 miles) and an additional 6.1 miles of transmission line infrastructure (an increase from 17 to 23.1 miles). Impacts related to Alternative C are conservatively estimated to be similar to Alternative B.

Direct and indirect impacts to air quality and visibility from well development, operations, and well reclamation, as well as the cumulative impacts of Alternative C, would be similar to those described under the Proposed Action. Anticipated air pollutant emissions would be comparable to the Proposed Action. Impacts to air quality and visibility would be the same during well development, operation, and well reclamation.

3.3.2.5 Alternative D (Preferred Alternative)

Alternative D reflects substantial changes to facility placement. While development of the well field and mine production levels would remain the same as Alternative B, other Project facilities, which were

located within the mine permit boundary for Alternatives B and C, would be moved to an area north of I 80. For Alternative D, the mine processing facility would be just over 100 km from the Bridger-Teton National Forest. The access road would run southeast toward the Project area and would run parallel to the proposed transmission line. The degree of disturbance within the mine permit boundary would be less than Alternatives B or C with the relocation of Project facilities; however, the relocation of Project facilities would increase the overall visual disturbance and footprint of the Project. Long-term disturbance during operation and maintenance of the Project would be similar in nature to Alternative B but would introduce additional miles of linear components. This includes an additional 13.4 miles of access roads, including existing access roads (an increase from 16.1 to 29.5 miles) (including existing) and an additional 12.5 miles of transmission line infrastructure (an increase from 17 to 29.5 miles). Project facilities would also result in an increase of piping between the mine permit boundary and Project facilities north of I 80.

Similar to the Proposed Action, the maximum annual emissions due to the Project from Alternative D are estimated to occur from Y8 through Y10 of the Project. Currently, the Project's highest annual estimated emissions would occur when the Section 22 and 27 facilities and the Section 25 and 26 mine well field are operating and the Section 23 and 24 mine well fields are being developed. The maximum estimated annual emissions for Alternative D are provided in Table 3.3-22.

Table 3.3-22. Alternative D: Maximum Estimated Annual Emission Totals

Emission Source	CO (tpy)	NOx (tpy)	SO ₂ (tpy)	VOC (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	HAPs (tpy)	CO _{2e} (Mtpy)
Operations point and fugitive sources	614	734	32	80	400	380	17	3,487,964
Operations mobile and portable sources	918	1,043	3	102	35	33	100	296,189
Well field development fugitive sources	0	0	0	0	94	10	0	0
Well field development mobile and portable sources	523	852	1	66	35	35	1	93,200
Mine site operations	2	3	<1	<1	3	<1	<1	15,536
Total	2,057	2,631	36	248	567	459	119	3,892,889

Source: Appendix K, Section 2.1.2.

Note: Pollutant emissions are expressed in tons per year (tpy), except for CO_{2e} which is expressed in metric tons per year (Mtpy). Total may not sum to total due to rounding.

Near-Field Modeling Results

As noted earlier in Section 3.3.2.3, the modeling results indicate that the Project would result in increases in criteria pollutants and HAPs. Multiple scenarios were modeled, and the maximum modeled concentrations are displayed in Table 3.3-23 below. While the maximum ambient concentrations using the maximum modeled concentrations are approaching the levels of the NAAQS and WAAQS, these increases do not result in concentrations greater than the NAAQS/WAAQS for any criteria pollutant for both the Proposed Action and Alternative D. Modeling results and a comparison to NAAQS/WAAQS are displayed in Table 3.3-23 below.

Table 3.3-23. Alternative D: National Ambient Air Quality Standards/Wyoming Ambient Air Quality Standards Analysis Summary

Pollutant	Averaging Period	Maximum Modeled Concentration (µg/m³)*	Background Concentration (µg/m³)	Maximum Ambient Concentration (µg/m³)	NAAQS/WAAQS (µg/m³)	Modeled Concentration below NAAQS
CO	1-hour†	623.70	933.6	1,557.30	40,000	Yes
	8-hour†	211.27	801.9	1,013.17	10,000	Yes
NO ₂	1-hour‡	150.30**	30.6	180.90	188	Yes
	Annual	32.88**	2.4	35.28	100	Yes
PM ₁₀	24-hour§	87.97	47.7	135.67	150	Yes
	Annual	19.51	7.8	27.31	50	Yes
PM _{2.5}	24-hour¶	12.44	18.0	30.44	35	Yes
	Annual	3.43	5.2	8.63	9	Yes
SO ₂	1-hour#	4.00	21.6	25.60	195	Yes
	3-hour†	2.87	25.0	27.87	1,300	Yes

Source: Appendix K, Section 4.3.1.

* The Maximum Modeled Concentration represents the highest of two scenarios modeled. See Appendix K for more detail.

† Represents the high 2nd high concentration.

‡ Represents the 98th percentile concentration over a 5-year period.

§ Represents the 6th highest concentration over a 5-year period.

¶ Represents the average of the 8th highest 24-hour concentrations over a 5-year period.

Represents the 99th percentile concentration over a 5-year period.

** Modeled using Tier 3 NO_x to NO₂ Ozone Limiting Method.

The highest predicted concentrations for all pollutants do not indicate potential exceedances of the NAAQS and WAAQS standards for CO, NO₂, PM₁₀, PM_{2.5}, and SO₂ for the project-only modeling.

Cumulative Near-Field Modeling Results

While potential violations of air quality standards were not predicted for the Dry Creek project-only modeling, violations of some standards were predicted by the modeling analysis completed for the Project West cumulative modeling assessment. In particular, the results from the air quality modeling referenced from the Project West EA disclosed potential violations of the 1-hour NO₂, 24-hour PM₁₀ and 24-hour and annual PM_{2.5} NAAQS.

In the Project West EA (BLM 2024d), cumulative effects to air quality resulting from the Proposed Action and the Dry Creek Alternative D emissions were modeled using AERMOD. The cumulative modeling evaluation considered operations during years 8 through 10 of the Dry Creek Mine operation as the worst-case emissions scenario. The cumulative modeling evaluation included Project West emissions sources, along with Dry Creek Mine processing plant operating emissions, Dry Creek Mine solution mining area operation emissions, and road travel to and from the Dry Creek Mine processing plant and solution mining areas. As detailed in the Project West EA, the modeling of cumulative emission sources demonstrated that estimated concentrations of most criteria pollutants were below the NAAQS. However, there were potential worst-case scenario areas of higher concentrations of NO₂, PM₁₀, and PM_{2.5}.

Modeling of cumulative emission sources demonstrated that estimated concentrations of most criteria pollutants were below the NAAQS and WAAQS. However, there were potential worst-case scenario areas of higher concentrations of NO₂, PM₁₀, and PM_{2.5}. Multiple scenarios were modeled, and the

maximum modeled concentrations are displayed in Table 3.3-24 below. Modeling results and a comparison to NAAQS/WAAQS are displayed in Table 3.3-24.

Table 3.3-24. Cumulative Near-Field Modeling National Ambient Air Quality Standards/Wyoming Ambient Air Quality Standards Analysis Summary

Pollutant	Averaging Period	Maximum Modeled Concentration ($\mu\text{g}/\text{m}^3$)*	Background Concentration ($\mu\text{g}/\text{m}^3$)	Maximum Ambient Concentration ($\mu\text{g}/\text{m}^3$)	NAAQS/WAAQS ($\mu\text{g}/\text{m}^3$)	Modeled Concentration below NAAQS
CO	1-hour [†]	4604.8	549.2	5154.0	40,000	Yes
	8-hour [†]	1030.3	457.7	1488.0	10,000	Yes
NO ₂	1-hour	453.6	---	464.9	188	No
	Annual	55.1	2.6	57.7	100	Yes
PM ₁₀	24-hour	272.9	43.0	315.9	150	No
PM _{2.5}	24-hour	35.3	14.0	49.3	35	No
	Annual	13.5	3.4	16.9	9	No
SO ₂	1-hour	8.4	23.6	32.0	195	Yes
	3-hour	7.2	23.6	30.8	1,300	Yes

Source: Appendix U, Section 5.0.

* The Maximum Modeled Concentration represents the highest of two scenarios modeled. See Appendix U for more detail.

The primary contributing source of worst-case scenario exceedances of the 1-hour NO₂ (464.9 $\mu\text{g}/\text{m}^3$), 24-hour PM_{2.5} (49.3 $\mu\text{g}/\text{m}^3$), and Annual PM_{2.5} (16.9 $\mu\text{g}/\text{m}^3$) concentrations were tailpipe emissions from land-clearing equipment. The extent of the exceedances is limited to an area immediately surrounding the modeled sources and dissipates quickly when moving away from the modeled sources. The general area around the exceedances is undeveloped rural areas along a commuting route, and although the area may be accessed by the public, the exposure would be limited to a short time. Additionally, there are no other developed areas or sensitive receptors where the public might have exposure for long durations of time.

The primary contributing source of worst-case scenario exceedances to the 24-hour PM₁₀ (315.9 $\mu\text{g}/\text{m}^3$) resulted from construction employees who will commute during wellfield development. The extent of these exceedances is limited to approximately 20 feet from the commuting route. Similarly to the NO₂ and PM_{2.5} exceedance areas, there are no other developed areas or sensitive receptors where the public would be exposed for long durations of time.

Combining this with the knowledge that the estimated concentrations were based on conservative assumptions, it is reasonable to conclude that it is highly unlikely that a member of the public would be impacted by these potential higher concentrations (BLM 2024d). The Project West NEPA Modeling Report is included for reference in Appendix U.

Hazardous Air Pollutants Modeling Results

The HAP impact assessment included the comparison of the modeled HAPs concentrations against RELs and RfCs. Results from the HAP modeling for Alternative D are displayed in Table 3.3-25 below.

Table 3.3-25. Alternative D: Hazardous Air Pollutant Reference Exposure Levels and Reference Concentrations

Pollutant/HAP	REL ($\mu\text{g}/\text{m}^3$)	RfC* ($\mu\text{g}/\text{m}^3$)	Maximum Modeled 1-hour Concentration ($\mu\text{g}/\text{m}^3$) [†]	Modeled Annual Concentration ($\mu\text{g}/\text{m}^3$)	Complies with REL and/or RfC
Formaldehyde	55 [‡]	9.8	7.69	0.43	Yes
Acetaldehyde	470 [‡]	9	2.73	0.15	Yes
Benzene	27 [‡]	30	1.44	0.08	Yes
Toluene	7,500 [§]	5,000	1.01	0.06	Yes
Ethylbenzene	22,000 [§]	1,000	0.12	0.01	Yes
Xylenes	8,700 [§]	100	0.37	0.02	Yes
n-Hexane	180,000 [¶]	700	1.09	0.03	Yes

Source: Appendix K, Section 4.3.3.

* Regional Screening Level Resident Ambient Air Table May 2022 (<https://semspub.epa.gov/work/HQ/402381.pdf>).

[†] The Maximum Modeled Concentration represents the highest of two scenarios modeled. See Appendix K for more detail.

[‡] California EPA REL for no adverse effects. Table 2. Acute Dose-Response Values for Screening Risk Assessments (EPA 2021a).

[§] Agency for Toxic Substances and Disease Registry minimal risk levels for no adverse effects for 1 to 14-day exposures. Table 2. Acute Dose-Response Values for Screening Risk Assessments (EPA 2021a).

[¶] Values referenced from National Institute for Occupational Safety and Health REL.

For carcinogenic HAPs (benzene, ethylbenzene, and formaldehyde), cancer risks were calculated and assessed against the significance criterion of one additional cancer per 1 million exposed persons (1×10^{-6}). The results of those analyses are presented in Table 3.3-26 below.

Table 3.3-26. Alternative D: Hazardous Air Pollutant Lifetime Cancer Risk Analysis

Pollutant/HAP	Inhalation Unit Risk* ($1/\mu\text{g}/\text{m}^3$)	Maximum Modeled Concentration ($\mu\text{g}/\text{m}^3$) [†]	MEI Lifetime Cancer Risk	MLE Lifetime Cancer Risk
Formaldehyde	0.000013	0.43	4.81E-06	5.31E-07
Acetaldehyde	0.0000022	0.15	2.84E-07	3.14E-08
Benzene	0.0000078	0.08	5.56E-07	6.14E-08
Toluene	–	0.06	–	–
Ethylbenzene	0.0000025	0.01	1.62E-08	1.79E-09
Xylenes	N/A	0.02	–	–
n-Hexane	N/A	0.03	–	–
Total cancer risk			6.30E-06	7.00E-07

Source: Appendix K, Section 4.3.3.

Note: N/A = not available.

* Integrated Risk Information System.

[†] The Maximum Modeled Concentration represents the highest of two scenarios modeled. See Appendix K for more detail.

The MEI's long-term risk for acetaldehyde and ethylbenzene is less than 1×10^{-6} . Similarly, the MLE risk for all analyzed pollutants also stays below this figure. In contrast, risks associated with formaldehyde and benzene for the MEI surpass 1×10^{-6} , but are less than 1×10^{-4} . When the MLE risks from benzene, acetaldehyde, ethylbenzene, and formaldehyde are combined, they remain beneath the 1×10^{-6} threshold.

The findings suggest a potential increased cancer risk in the MEI assessment. A total cancer risk of 6.30×10^{-6} was estimated for the MEI case. It is crucial to emphasize that the projected maximum concentrations and risk increments are very localized. For a cancer risk lower than one-in-1-million over a 70-year MEI exposure, the distance is estimated to be 540 m away from the processing facility's eastern property boundary. An isopleth showing the extents of the predicted exceedances is presented on Figure 3.3-3 in Appendix Q.

Requested Class II – Flaming Gorge National Recreation Area

Similar to the NAAQS/WAAQS analysis presented above, dispersion modeling was performed to predict the ambient air impacts at the Flaming Gorge NRA Class II area. The results of the dispersion modeling and a comparison to the AAQS are displayed in Table 3.3-27 below.

Table 3.3-27. Alternative D: Flaming Gorge National Recreation Area Class II National Ambient Air Quality Standards/Wyoming Ambient Air Quality Standards Analysis Summary

Pollutant	Averaging Period	Maximum Modeled Concentration ($\mu\text{g}/\text{m}^3$)*	Background Concentration ($\mu\text{g}/\text{m}^3$)	Maximum Ambient Concentration ($\mu\text{g}/\text{m}^3$)	NAAQS/WAAQS ($\mu\text{g}/\text{m}^3$)	Modeled Concentration < NAAQS
CO	1-hour [†]	94.91	933.6	1,028.51	40,000	Yes
	8-hour [†]	15.34	801.9	817.24	10,000	Yes
NO ₂	1-hour [‡]	51.50	30.6	82.10	188	Yes
	Annual	0.77	2.4	3.17	100	Yes
PM ₁₀	24-hour [§]	2.49	47.7	50.19	150	Yes
	Annual	0.30	7.8	8.10	50	Yes
PM _{2.5}	24-hour [¶]	0.31	18	18.31	35	Yes
	Annual	0.07	5.2	5.27	9	Yes
SO ₂	1-hour [#]	0.82	21.6	22.42	195	Yes
	3-hour [†]	0.70	25	25.70	1,300	Yes

Source: Appendix K, Section 4.3.2.

* The Maximum Modeled Concentration represents the highest of two scenarios modeled. See Appendix K for more detail.

[†] Represents the high 2nd high concentration.

[‡] Represents the 98th percentile concentration over a 5-year period.

[§] Represents the 6th highest concentration over a 5-year period.

[¶] Represents the average of the 8th highest 24-hour concentrations over a 5-year period.

[#] Represents the 99th percentile concentration over a 5-year period.

The impacts predicted by dispersion modeling when added to the representative background concentrations are below the respective standards for all pollutants and averaging periods at the Flaming Gorge NRA Class II area.

Dry deposition modeling was performed to assess the atmospheric deposition of sulfur and nitrogen at the Flaming Gorge NRA Class II area. The results of those analyses are presented in Table 3.3-28 below.

Table 3.3-28. Alternative D: Flaming Gorge National Recreation Area Class II Deposition Analysis Impacts

Pollutant	Maximum Dry Deposition (g/m ³)*	HNO ₃ /NO ₂ Ratio	Molecular Weight Ratio	Project Dry Deposition (kg/ha/yr)	DAT (kg/ha/yr)	Project Deposition < DAT
NO ₂	0.00006	1.37	0.22	0.00001808	0.005	Yes
SO ₂	0.00001	–	0.5	0.00000500	0.005	Yes

Source: Appendix K, Section 4.3.2.

* The Maximum Dry Deposition represents the highest of two scenarios modeled. See Appendix K for more detail.

For the Flaming Gorge NRA, maximum impacts were compared against the DAT of 0.005 kg/ha/yr. The findings show that the maximum deposition in the analyzed region for both sulfur and nitrogen fall below the DAT.

A Level-1 VISCREEN analysis was performed to evaluate pollutant color and contrast, assuming the worst possible dispersion condition (combination of wind speed and stability class) regardless of actual meteorology at the site. If visibility criteria in the model are not exceeded, the analysis is complete, and the Project is not likely to have a significant impact on visibility. The results of those analyses are presented in Table 3.3-29 below.

Table 3.3-29. Alternative D: Flaming Gorge National Recreation Area Class II Visibility Analysis Results – Level 1

Observation Point	Viewing Background	Delta E		Contrast	
		Criterion	Plume	Criterion (absolute)	Plume
Flaming Gorge National Recreation Area	Sky	2.00	4.201	0.05	0.064
	Sky	2.00	1.411	0.05	-0.040
	Terrain	2.00	8.895	0.05	0.082
	Terrain	2.00	1.373	0.05	0.025

Source: Appendix K, Section 4.3.2.

The results for the Level 1 screening analysis showed exceedances of the Class I screening criteria (2.0 for color difference index and 0.05 for contrast). Because the values were exceeded, a Level 2 analysis is required. The results of this analysis are presented in Table 3.3-30 below.

Table 3.3-30. Alternative D: Flaming Gorge National Recreation Area Class II Visibility Analysis Results – Level 2

Observation Point	Viewing Background	Delta E		Contrast	
		Criterion	Plume	Criterion (absolute)	Plume
Flaming Gorge National Recreation Area	Sky	2.00	3.930	0.05	0.054
	Sky	2.00	0.954	0.05	-0.034
	Terrain	2.00	8.895	0.05	0.061
	Terrain	2.00	1.373	0.05	0.027

Source: Appendix K, Section 4.3.2.

The results for the Level 2 screening analysis showed exceedances of the Class I screening criteria (2.0 for color difference index and 0.05 for contrast). This analysis is considered conservative, as many of the emissions would be generated during daytime hours, and the emission sources are scattered throughout the mine site, resulting in more dispersed emissions than predicted by the model. The nearest Class I area is Bridger Wilderness, located 150 km north of the Project. Because there are no Class I areas located within the maximum range of the VISCREEN model (50 km), there are no criteria available to assess visibility. Therefore, the Class II visibility analysis is for informational purposes, as there is no established criterion for Class II areas.

Far-Field Modeling Results

Concentrations

This section presents the Alternative D CALPUFF concentration predictions at the Class I and Class II areas and their respective SILs for comparison purposes. PSD increments are also shown for reference only. The results of those analyses are presented in Table 3.3-31 below.

For the Class I areas, the SO₂ and NO₂ impacts are all well below the respective SILs. The 3-hour and 24-hour SO₂ impacts are highest at the Bridger and Mount Zirkel Wilderness Areas. Both SO₂ and NO₂ annual-average impacts are highest at Mount Zirkel Wilderness. Modeled PM_{2.5} concentrations are below the 24-hour and annual SILs for all years for all Class I areas. Modeled PM₁₀ concentrations are below the 24-hour and annual SILs for all years for all Class I areas.

For the Class II areas, the SO₂ and NO₂ impacts are all well below the respective SILs. The 3-hour and 24-hour SO₂ impacts are highest at Fossil Butte National Monument. For PM_{2.5}, both Class II areas are below the 24-hour and annual SILs for all years. Similar to the PM_{2.5} results, the PM₁₀ impacts at both Class II areas are below the 24-hour and annual SILs for all years.

Visibility

This subsection presents visibility results for the Class I and Class II areas in terms of the number of days greater than 0.5 dv, and the 98th percentile impact (in deciviews). Table 3.3-32 presents the number of exceeding days and the 98th percentile deciview impacts.

For Class I areas, the highest visibility impacts occur at the Bridger and Mount Zirkel Wilderness Areas. There are no exceedance days for any Class I areas except for Bridger, which has only 1 day in year 2020 exceeding 0.5 dv. There are no instances of the 98th percentile impact exceeding the 0.5-dv threshold value at any Class I area for any of the modeled years. Both analyzed Class II areas exceed the 0.5-dv thresholds on some days for all years. The 98th percentile impacts are greater than 0.5 dv for Dinosaur National Monument for 2019 only, while they are lower than 0.5 dv for Fossil Butte National Monument for all 3 modeled years.

Deposition

This subsection presents the Alternative D CALPUFF concentration predictions at the Class I and II areas and their respective SILs for comparison purposes and PSD increments for reference only. The results of those analyses are presented in Table 3.3-33 below.

There are no exceedances of the 0.005 kg/hour/yr DAT for either sulfur or nitrogen at any Class I or Class II areas for any of the modeled years.

Table 3.3-31. Alternative D Class I and II Area Concentration Results – Far-Field Analysis Area

Pollutant (µg/m³)	Averaging Time	SIL	PSD Increment	Class I Areas								SIL	PSD Increment	Class II Areas	
				Arches National Park	Bridger Wilderness	Fitzpatrick Wilderness	Flat Tops Wilderness	Grand Teton National Park	Mount Zirkel Wilderness	Teton Wilderness	Washakie Wilderness			Dinosaur National Monument	Fossil Butte National Monument
NO ₂	Annual	0.1	2.5	0.0004	0.0014	0.0005	0.0014	0.0003	0.0025	0.0002	0.0002	1	25	0.014	0.004
PM ₁₀	24 hour	0.32	8	0.02	0.18	0.05	0.10	0.02	0.08	0.02	0.02	5	30	1.24	0.09
	Annual	0.16	4	0.0008	0.0025	0.001	0.0024	0.0006	0.0031	0.0004	0.0004	1	17	0.012	0.005
PM _{2.5}	24 hour	0.27	2	0.01	0.10	0.05	0.03	0.02	0.07	0.02	0.02	1.2	9	0.28	0.07
	Annual	0.05	1	0.0006	0.0019	0.0008	0.0016	0.0005	0.0025	0.0004	0.0003	0.2	4	0.007	0.004
SO ₂	3 hour	1	25	0.003	0.0011	0.005	0.004	0.005	0.009	0.005	0.004	25	512	0.02	0.03
	24 hour	0.2	5	0.0012	0.0035	0.0012	0.0011	0.0014	0.0035	0.001	0.0009	5	91	0.005	0.005
	Annual	0.1	2	0.00003	0.00009	0.00004	0.00007	0.00002	0.00012	0.00002	0.00002	1	20	0.0003	0.0002

Source: Appendix L, Sections 5.1 and 5.4. Data from 2019 to 2021 was analyzed, but the table above displays the highest value between the 3 years.

Table 3.3-32. Alternative D Class I and II Area Visibility Results – Far-Field Analysis Area

Class I and Class II Areas		Number of Days > 0.5 dv 24-hour			Number of Days > 1.0 dv 24-hour		
		2019	2020	2021	2019	2020	2021
Class I Area	Arches National Park	0	0	0	0	0	0
	Bridger Wilderness	0	1	0	0	0	0
	Fitzpatrick Wilderness	0	0	0	0	0	0
	Flat Tops Wilderness	0	0	0	0	0	0
	Grand Teton National Park	0	0	0	0	0	0
	Mount Zirkel Wilderness	0	0	0	0	0	0
	Teton Wilderness	0	0	0	0	0	0
	Washakie Wilderness	0	0	0	0	0	0
Class II Area	Dinosaur National Monument	10	5	3	0	4	0
	Fossil Butte National Monument	3	1	1	0	0	0

Source: Appendix L, Sections 5.2 and 5.5.

* Value exceeds FLAG threshold for contribution to visibility impairment.

Table 3.3-33. Alternative D Class I and II Area Deposition Results – Far-Field Analysis Area

Constituent	DAT Values (kg/ha/yr)	Class I Areas								Class II Areas	
		Arches National Park	Bridger Wilderness	Fitzpatrick Wilderness	Flat Tops Wilderness	Grand Teton National Park	Mount Zirkel Wilderness	Teton Wilderness	Washakie Wilderness	Dinosaur National Monument	Fossil Butte National Monument
Sulfur	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrogen	0.005	<0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.001	0.004	0.002

Source: Appendix L, Sections 5.3 and 5.6. Data from 2019 to 2021 was analyzed, but the table above displays the highest value between the 3 years.

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Cumulative Far-Field Modeling Results

Percent contributions to the cumulative value from Dry Creek Alternative D and Project West were not calculated in the far-field modeling report but are expected to follow the same trends as the cumulative modeling for the Proposed Action and Project West.

Concentrations

This subsection presents the Alternative D and Project West cumulative impact CALPUFF modeled concentrations at the Class I areas and their respective SILs for comparison purposes. PSD increments are also shown for reference only. The results of those analyses are presented in Table 3.3-34 below.

For the Class I areas, the SO₂ and NO₂ impacts are all well below the respective SILs. The 3-hour and 24-hour SO₂ impacts are highest at the Bridger and Mount Zirkel Wilderness Areas. Both SO₂ and NO₂ annual-average impacts are highest at the Mount Zirkel Wilderness. This is consistent with the prevailing wind directions from west-northwest. Modeled PM_{2.5} concentrations are below the 24-hour and annual SILs for all years for all Class I areas. Modeled PM₁₀ concentrations are below the 24-hour and annual SILs for all years for all Class I areas. Note that PSD increments and SIL are meant for individual projects only, and comparisons are shown for informational purposes only.

For the Class II areas, the SO₂ and NO₂ impacts are all well below the respective SILs. The 3-hour and 24-hour SO₂ impacts are highest at Dinosaur National Monument. For PM_{2.5}, both Class II areas are below the 24-hour and annual SILs for all years. Similar to the PM_{2.5} results, the PM₁₀ impacts at both Class II areas are below the 24-hour and annual SILs for all years.

Visibility

This subsection presents cumulative impact visibility results for the Class I and Class II areas in terms of the number of days greater than 0.5 dv, and the 98th percentile impact (in deciviews). Table 3.3-35 presents the number of exceeding days and the 98th percentile deciview impacts.

For Class I areas, the highest visibility impacts occur at Bridger Wilderness. There is only one day exceeding 0.5 dv at the Bridger, Fitzpatrick, and Flat Tops Wilderness Areas. At other Class I areas, no days exceed 0.5 or 1.0 dv for any year. There are no instances of the 98th percentile impact exceeding the 0.5-dv threshold value at any Class I area for any of the modeled years. Both analyzed Class II areas exceed the 0.5-dv thresholds on some days for all years. The 98th percentile impacts are greater than 0.5 dv for Dinosaur National Monument for years 2019 and 2020, and for year 2019 at Fossil Butte National Monument.

Deposition

This subsection presents the cumulative impact deposition results at the Class I and II areas. The results of those analyses are presented in Table 3.3-36 below.

There are no exceedances of the critical loads for nitrogen or sulfur deposition at any Class I or Class II areas for any of the modeled years.

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Table 3.3-34. Alternative D and Project West Class I and II Area Concentration Results – Cumulative Far-Field Analysis Area

Pollutant (µg/m³)	Averaging Time	SIL (µg/m³)	PSD Increment (µg/m³)	Class I Areas								SIL (µg/m³)	PSD Increment	Class II Areas	
				Arches National Park	Bridger Wilderness	Fitzpatrick Wilderness	Flat Tops Wilderness	Grand Teton National Park	Mount Zirkel Wilderness	Teton Wilderness	Washakie Wilderness			Dinosaur National Monument	Fossil Butte National Monument
NO ₂	Annual	0.1	2.5	0.0007	0.0020	0.0007	0.0021	0.0004	0.0038	0.0003	0.0003	1	25	0.021	0.008
PM ₁₀	24 hour	0.32	8	0.02	0.18	0.07	0.11	0.03	0.08	0.03	0.02	5	30	1.38	0.16
	Annual	0.16	4	0.0011	0.0032	0.0012	0.0030	0.0008	0.0041	0.0006	0.0006	1	17	0.015	0.008
PM _{2.5}	24 hour	0.27	2	0.02	0.11	0.06	0.04	0.03	0.08	0.02	0.02	1.2	9	0.31	0.13
	Annual	0.05	1	0.0009	0.0024	0.001	0.0022	0.0007	0.0033	0.0005	0.0005	0.3	4	0.009	0.006
SO ₂	3 hour	1	25	0.003	0.011	0.005	0.004	0.005	0.010	0.006	0.004	25	512	0.02	0.03
	24 hour	0.2	5	0.0013	0.0036	0.0013	0.0013	0.0015	0.0037	0.0012	0.001	5	91	0.005	0.006
	Annual	0.1	2	0.00003	0.0001	0.00004	0.00008	0.00002	0.00014	0.00002	0.00002	1	20	0.0003	0.0003

Source: Appendix L, Sections 8.1 and 8.4. Data from 2019 to 2021 was analyzed, but the table above displays the highest value between the 3 years.

Table 3.3-35. Alternative D and Project West Class I and II Area Visibility Results – Cumulative Far-Field Analysis Area

Class I and Class II Areas		Number of Days > 0.5 dv 24-hour			Number of Days > 1.0 dv 24-hour		
		2019	2020	2021	2019	2020	2021
Class I Area	Arches National Park	0	0	0	0	0	0
	Bridger Wilderness	0	1	0	0	0	0
	Fitzpatrick Wilderness	0	1	0	0	0	0
	Flat Tops Wilderness	1	0	0	0	0	0
	Grand Teton National Park	0	0	0	0	0	0
	Mount Zirkel Wilderness	0	0	0	0	0	0
	Teton Wilderness	0	0	0	0	0	0
	Washakie Wilderness	0	0	0	0	0	0
Class II Area	Dinosaur National Monument	20*	9*	4	4	4	0
	Fossil Butte National Monument	10*	6	4	2	0	1

Source: Appendix L, Sections 8.2 and 8.5.

* Value exceeds FLAG threshold for contribution to visibility impairment.

Table 3.3-36. Alternative D and Project West Class I and II Area Deposition Results – Cumulative Far-Field Analysis Area

Constituent	Class I Areas								Class II Areas	
	Arches National Park	Bridger Wilderness	Fitzpatrick Wilderness	Flat Tops Wilderness	Grand Teton National Park	Mount Zirkel Wilderness	Teton Wilderness	Washakie Wilderness	Dinosaur National Monument	Fossil Butte National Monument
Critical load for nitrogen (kg/ha-yr)	3	3	3	4	4	4	4	3	3	3
Sulfur	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrogen	<0.001	0.003	0.002	0.003	0.001	0.003	0.001	0.001	0.007	0.004

Source: Appendix L, Sections 8.3 and 8.6. Data from 2019 to 2021 was analyzed, but the table above displays the highest value between the 3 years.

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Modeled Emission Rates for Precursors Modeling Results

The EPA issued a memorandum on April 30, 2024, that provided updated guidance on the methodology of using MERPs as a Tier I demonstration tool for ozone and secondary PM_{2.5}. In accordance with this guidance, a MERPs analysis was performed for precursor pollutants related to O₃ and secondary PM_{2.5}. This demonstration tool provides a simple way to relate maximum downwind impacts with a critical air quality threshold, such as the SIL or NAAQS.

The total Project emissions do not exceed the illustrative MERP values from the EPA MERP guidance for the daily or annual PM_{2.5} averaging periods. Therefore, the recommended SILs would not be exceeded when considering the combined impacts of the precursors. The 8-hour O₃ MERP value for NO_x was exceeded by the Project emissions. The SIL for O₃ is expected to be exceeded by the Project's emissions of precursors. Therefore, a NAAQS analysis was performed, and the results are provided in Table 3.3-37.

Table 3.3-37. Alternative D: Ozone National Ambient Air Quality Standards Analysis

Precursor	Average	Hypothetical Source* (tpy)	Modeled Impact of Hypothetical Source* (ppb)	O ₃ – Project Contribution (ppb)
VOC	Annual	500	0.1646	0.08
NO _x	Annual	1,000	1.8069	4.75
Project O ₃ contribution				4.83
O ₃ background concentration†				62.00
Total 8-hour O ₃ concentration				66.83
8-hour O ₃ NAAQS				70.00

Source: Appendix K, Section 4.3.4.

* Data for Sweetwater County, Wyoming. EPA MERPs View Qlik.

† Data from Hiawatha Green Site monitor for the years 2018–2020. (H4H)

When the source impact is combined with the nearby monitor design value, the projected value is less than the level of the O₃ NAAQS.

The MERPs values for PM_{2.5} precursors were also used to predict the PM_{2.5} secondary contribution anticipated from the Project emissions. The results of the analysis are provided in Table 3.3-38.

Table 3.3-38. Alternative D: Particulate Matter of 2.5 Microns or Less Secondary Contribution

Precursor	Average	Hypothetical Source* (tpy)	Modeled Impact of Hypothetical Source* (µg/m ³)	PM _{2.5} - Project Contribution (µg/m ³)
SO ₂	Annual	1,000	0.00657	0.00024
	24-hour	1,000	0.14600	0.00526
NO _x	Annual	1,000	0.00483	0.01271
	24-hour	1,000	0.05842	0.15370
24-hour PM _{2.5} secondary contribution				0.15890
Annual PM _{2.5} secondary contribution				0.01295

Source: Appendix K, Section 4.3.4.

* Data for Sweetwater County, Wyoming. EPA MERPs View Qlik.

When the source impact is compared to the respective SIL, the 24-hour projected value for PM_{2.5} of 0.16 µg/m³ is below the PM_{2.5} SIL of 1.2 µg/m³. The annual PM_{2.5} projected value of 0.013 µg/m³ is below the PM_{2.5} recommended SIL of 0.13 µg/m³.

When assessing both primary and secondary PM_{2.5} impacts, the EPA recommends combining these impacts and then adding a representative background concentration for comparison against the NAAQS. Under Alternative D, the sum of the 24-hour secondary PM_{2.5} impact (0.16 µg/m³), the 24-hour direct PM_{2.5} impact (12.44 µg/m³), and the 24-hour PM_{2.5} background (18.0 µg/m³) is 30.6 µg/m³, which is below the 24-hour PM_{2.5} NAAQS of 35 µg/m³. The sum of the annual secondary PM_{2.5} impact (0.013 µg/m³), the annual direct PM_{2.5} impact (3.43 µg/m³), and the annual PM_{2.5} background (5.2 µg/m³) is 8.6 µg/m³, which is below the annual PM_{2.5} NAAQS of 9 µg/m³.

Greenhouse Gases and Climate Change

Well development (drill rig engines, mud pumps, generators, on-road mobile sources, off-road mobile sources, etc.), well reclamation, and operational activities (co-generation facility, lime kilns, on-road mobile sources, product transport, processing facilities venting, etc.) would result in GHG emissions from equipment exhaust and vehicle exhaust caused by travel to and from the Project area. Emissions from paved and unpaved road traffic would occur over a large area, resulting in negligible impacts at any given location. No methane release is expected at the well heads as this is a closed system until the brine solution enters the atmospheric storage tanks at the mine site. For the storage tanks, Pacific Soda calculated a total potential-to-emit of 84 tons per year of methane in the Mine Site Minor Source Permit (approved by Wyoming DEQ Air Quality Division in 2024). This projected emission volume was based on the measured emissions at Kazan Soda, which is considered to be conservative compared to the anticipated conditions in Sweetwater County. Tables 3.3-22 and 3.3-39 present the estimated maximum annual GHG emissions and the speciated annual GHG emissions that would occur during the life of the Project. Table 3.3-40 presents the estimated total GHG emissions over the entire life of the Project.

Table 3.3-39. Alternative D: Maximum Annual Greenhouse Gas Totals

Emission Source	CO ₂ (MTpy)	CH ₄ (MTpy)	N ₂ O (MTpy)	CO ₂ e (MTpy)
Operations point and fugitive sources	3,468,168	235	47	3,487,964
Operations mobile and portable sources	294,382	18	5	296,189
Well field development mobile and portable sources	92,889	4	1	93,200
Mine site operations	283	610	0	15,536
Total	3,855,722	866	52	3,892,889

Notes: Total may not sum to total due to rounding.

Table 3.3-40. Alternative D: Project Lifetime Greenhouse Gas Totals

Emission Source	CO ₂ (MT)	CH ₄ (MT)	N ₂ O (MT)	CO ₂ e (MT)
Project lifetime total	77,365,940	17,337	1,042	78,109,949

Alternative D would generate approximately 3,892,889 MT of CO₂e during the peak year of activity. This is equivalent to the GHG emissions from 926,515 gasoline-powered passenger vehicles driven for 1 year. It is also equivalent to the annual CO₂ emissions from 1 coal-fired power plant in 1 year. Alternative D would generate approximately 78,109,949 MT of CO₂e over the lifetime of the Project.

The majority of GHG emissions are from the Operations Point and Fugitive Sources group, specifically from the cogeneration facility natural gas-fired turbines with heat recovery steam generators denoted “GT and HRSG” in the emissions inventory (Barr Engineering 2023), which alone contribute 2,272,384 MTpy CO₂e or 58% of the maximum annual GHG emissions for the Project.

The impacts of GHG emissions from Alternative D would be low compared to the analysis area’s existing emissions (Table 3.3-5). CO₂e emissions from Alternative D represent 7.46% of the overall CO₂e emissions for Wyoming and 0.07% of the overall CO₂e emissions for the United States. Project GHG emissions comparisons are based on potential to emit and represent the highest possible CO₂e emissions, which have been compared to actual state and U.S. emissions. This is a conservative approach. Although the Project would be allowed to emit the maximum quantity of emissions allowed in its air permit, the Project would not always emit the maximum but a lesser amount to maintain compliance.

3.3.2.6 *Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity*

For the Alternatives B, C, and D, the increase in air pollutant concentrations and GHG emissions would constitute impacts that cannot be avoided. Impacts on air quality from mining and associated activities would occur during the estimated 34-year life of the Project, including construction, operations, and reclamation, and are expected to end with mine reclamation and return to pre-mining levels, assuming adequate revegetation success to stabilize dust emissions from disturbed areas.

During the construction and mining phases of the Project, air pollutant concentrations would be higher throughout the analysis area than current levels but within applicable air quality standards except for the limited exceedances detailed above. Following mine closure and successful reclamation, pollutant concentrations from the Project would cease, and there would be no long-term irreversible commitment of resources.

3.3.2.7 *Cumulative Impacts*

The modeling analysis area used to assess direct and indirect impacts to air quality encompassed an area up to 300 km from the Project. This area is much greater than the area where impacts were modeled to occur. Accordingly, the air quality impacts described in Section 3.3.2 are representative of direct, indirect, and cumulative impacts.

The cumulative effects analysis area for air quality is identical to the model analysis area. Air quality standards were met within the Project property boundary far removed from population centers and included a representative background concentration that could combine with Project emissions to impact air quality. As described in Section 3.3, the nearest residence is approximately 2.4 (Alternative D) to 4.9 km (Proposed Action). The nearest population center, Green River, is approximately 12 to 27 km to the northeast.

There are reasonably foreseeable trends and future actions within the analysis areas that may impact air quality and GHG emissions by the construction and operation of the Project described herein. In addition to the two proposed solution-based trona mine projects (Project West Trona Mine Project and American Soda Solution Mining Expansion), the majority of the RFFAs listed in Table E-1 (Appendix E) are transportation improvements and recreational trail enhancement projects. Potential emissions from the various transportation improvement and trail enhancement projects are difficult to assess, as they have not been estimated as part of any federal process. However, they would be anticipated to be temporary and transient in nature. In addition, emissions data associated with the proposed American Soda Solution Mining Expansion, Southwest Wyoming Carbon Dioxide Sequestration Project, and Sweetwater Carbon

Storage Hub Project are not yet available, and the additional mineral lease for American Soda has not been awarded. Without quantified emissions, these projects cannot be incorporated into any dispersion modeling (near-or far-field). Emissions data for Project West Trona Mine Project were accounted for in the revised far-field modeling assessment (Appendix L).

In lieu of modeling, the metrics used to quantify the cumulative impacts to air quality is tons of emissions within the general airshed. The primary source of emissions from most construction and mine projects is particulate matter; this analysis focuses on PM₁₀ as the metric of interest. The Project is estimated to produce a maximum of 564 tons of PM₁₀ under the Proposed Action and 567 tons of PM₁₀ under Alternative D, annually. On an annual basis this represents approximately 2.64% and 2.66% of the emissions for Sweetwater County, Wyoming, respectively.

In terms of GHG impacts, as noted in Section 3.3.2, CEQ guidance recommends that direct and indirect GHG emissions be estimated and disclosed by alternative. The Proposed Action would generate approximately 3,880,092 MT of CO₂e during the peak year of activity and approximately 77,679,301 MT of CO₂e over the lifetime of the Project. Alternative D would generate approximately 3,892,747 MT of CO₂e during the peak year of activity and approximately 77,914,927 MT of CO₂e over the lifetime of the Project. On an annual basis, this represents 7.43% to 7.46% of the annual emissions for Wyoming, or approximately 0.07% of the annual emissions for the United States, depending on the alternative. The temporary construction emissions associated with the transportation improvement and trail enhancement projects would be considered to have a lower overall potential to contribute to cumulative local, regional, or national GHG emissions. The solution-based trona mine projects would be anticipated to be a source of GHG emissions and would be similar in nature to the Dry Creek Trona Mine. Project GHG emissions comparisons are based on potential to emit and represent the highest possible CO₂e emissions, which have been compared to actual state and U.S. emissions. This would be a conservative approach. While the Project would be allowed to emit the maximum quantity of emissions allowed in its air permit, the Project would not always emit the maximum but a lesser amount to maintain compliance.

Pacific Soda is well aware of impacts from climate change and has incorporated design features into the Project to accommodate such potential future changes. As documented in its water yield analysis for the State Engineer's Office as part of the Industrial Siting Permit Application, Pacific Soda has identified water mitigation strategies, including a contract for storage water in Fontenelle Reservoir and investigating the purchase of available water rights with a lower priority date. The Project is also scalable, such that it can operate with less water during periods of partial curtailment. Finally, the Project will be equipped with the best available control technology per the requirements of its forthcoming PSD and Title V permits from the Wyoming DEQ Air Quality Division. These emission reduction requirements will mitigate the impact of the Project on climate change. Furthermore, to the extent that carbon capture facilities do come online as proposed, Pacific Soda has designed its facility to allow it to connect to these storage facilities. Pacific Soda will maintain close and constant coordination with BLM and private landowners in regard to adaptive land management to support site resiliency within the Project area. Likewise, the company will be actively engaged for the mining lifecycle (construction through operations through closure and reclamation) and will be in constant coordination with federal and state agencies to identify and meet adaptive resource management goals to account for potential impacts of climate change.

Pacific Soda has committed to providing bus service for construction workers during construction and for operational workers during operations as part of its Industrial Siting Permitting process. This will help reduce GHG emissions related to the Project from tailpipe emissions with fewer individual vehicles on the road. Additionally solar power does not provide the consistent power necessary to maintain function of the processing facility that will operate 24 hours per day. Pacific Soda has been told that the space necessary for solar power to power the processing facility would fill up significant acreage covered in

solar panels, which would create more environmental impacts. Pacific Soda is willing and able to use solar power for small-scale operations distanced from power supply and will explore additional options as technology advances.

The emission inventory was developed based on the assumption of using Tier 2 engines for the inventory to provide more realistic emission estimates. Pacific Soda has since evaluated the use of Tier 4 engines. While Tier 4 standards have been in effect for equipment manufactured since 2015, the availability of these engines in drilling equipment could prevent the project from operating at the required capacity. Pacific Soda will make efforts to use Tier 4 engines wherever possible with its construction contractors, but the associated costs are substantial. Furthermore, reducing the number of drill rigs would not allow the project to meet the execution schedule or deliver the necessary brine capacity for the processing facility to operate at economically viable levels.

Soda ash is an important input into solar cell production, and additional solar energy could potentially displace energy from fossil fuels in electricity production. Other beneficial uses include water softening, treating acidity in lakes, and purifying exhaust of fossil fuel power plants. While it would be difficult to predict the final uses of the soda ash from this site, soda ash as a whole is an important commodity used by many industries. Most importantly, soda ash is an essential material to help develop the renewable energy infrastructure needed to reduce carbon footprint. While these downstream emissions could provide a net benefit, quantifying those GHG emissions is not reasonably foreseeable.

3.4 Soils

The Environmental Consequences section below discusses potential impacts on soil resources from Project construction, ongoing operations, and future closure and reclamation at the proposed mine site. The analysis in this section addresses the acreage of impact to soils; erodibility indices for Natural Resources Conservation Service (NRCS)–mapped soil types, including K factor, which is a measure of water erodibility (Appendix Q, Figure 3.4-1), and wind erodibility index (Appendix Q, Figure 3.4-2); and potential feasibility of soil salvage and use as reclamation growth medium for revegetation.

The analysis area for impacts to soils consists of the hydrologic unit code (HUC)-12 subwatersheds (NRCS 2020) within which the proposed mining activities would occur for the Project alternatives being considered. These subwatersheds, which comprise 460,668 acres, are Chicken Springs Draw-Green River (140401060105), Town of Granger-Blacks Fork (140401071001), 140401071007-Blacks Fork (140401071007), 140401071008-Blacks Fork (140401071008), The Bluffs-Blacks Fork (140401071005), Upper Meadow Springs Wash (14040171003), Lower Meadow Springs Wash (140401071004), Middle Firehole Canyon-Green River (140401060101), Chicken Draw (140401071006), Flaming Gorge Reservoir-Blacks Fork (140401071009), Lower Big Dry Creek (140401070910), Middle Big Dry Creek (14041070907), Upper Little Dry Creek (14040170908), Lower Little Dry Creek (14040170909), Telephone Canyon-Green River (140401030610), and Milk Ranch Wash-Green River (140401030608) (Appendix Q, Figures 3.4-1 and 3.4-2).

3.4.1 Affected Environment

Soils in the analysis area are generally within the taxonomic soil orders of aridisols (dry soils of the desert) and entisols (young soils with little/no profile development) with small areas of inceptisols (young soils with little/no eluviation or illuviation) (NRCS 2015). The dominant soil temperature regime is frigid, and the soil moisture regime is aridic. The Web Soil Survey is an online soil mapping tool and database of soil properties managed by the NRCS, which identifies many soils in the Project area as having the potential to be sodium-affected, meaning the salt content is higher than average, which can damage plant roots, affect plant growth, and decrease the porosity of soil that is necessary for sufficient air and water

needs for plant growth (NRCS 2023a). Slopes generally range from 0% to 20% and can be greater than 20% with steeper areas present along badland escarpments, rock outcrops, and sand dunes. The *Permit to Mine Soil Survey Report* (Appendix F) includes a listing and detailed description of dominant soil map units within these soil orders for a majority of the Proposed Action footprint and discusses potential and feasible soil salvage areas for portions of the Project area (Wenck 2021).

The K factor and wind erodibility index, which are key indicators of susceptibility to soil erosion within the HUC-12 subwatersheds, can be derived from the NRCS Web Soil Survey for the soil map units, as summarized in Table 3.4-1. According to the NRCS, a soil's K factor is an index that quantifies the relative susceptibility of the soil to sheet and rill erosion. For example, soils high in clay typically have low K values, because they are more resistant to detachment. K factors range from 0.02 for the least water-erodible soils to 0.64 for the most water-erodible soils, with a K value of greater than 0.4 being used as an indicator for high potential of impact from water erosion (NRCS 2020). As shown in Table 3.4-1, the analysis area contains soils that tend toward being low to moderately water erodible, with 83% of the analysis area having a K factor below 0.4, which should be considered within the context of the arid climate of the analysis area.

The NRCS also provides a wind erodibility index for soils, which is a rough indication of the estimated tons of soil lost per year to wind erosion within each soil type. The wind erodibility index ranges from 0 for soils that are unlikely to be eroded by wind up to 310 for soils most likely to be eroded by wind. A wind erodibility index value greater than 55 is used as an indicator for a higher level of potential impact from wind erosion. As shown in Table 3.4.1, the analysis area contains soils that tend toward being more wind erodible, with most soils in the analysis area tending toward moderately wind-erodible, and 70% of the area having a wind erodibility index ranging between 56 and 86. Additionally, another 10% of the analysis area is considered to be highly wind erodible with a wind erodibility index of 134.

Table 3.4-1. Analysis Area Soils Characteristics

K Factor			Wind Erodibility Rating (WER)		
K Factor	Area (acres)	Percentage of Analysis Area	WER Index	Area (acres)	Percentage of Analysis Area
0.00–0.02	0	0%	48	41,209	9%
0.02–0.30	199,775	43%	56	128,012	28%
0.31–0.40	177,916	39%	86	189,393	41%
0.41–0.50	33,430	7%	134	46,571	10%
0.51–0.64	0	0%	220	1,089	0.2%
–	–	–	250	995	0.2%
Undefined	49,547	11%	Undefined	53,399	12%
Total	460,668	100%		460,668	100%

Source: NRCS (2023b).

Note: Undefined = Null in the dataset, not mapped/no data (sometimes due to being open water, bed rock, or other unusual conditions).

Noxious weeds and nonnative or invasive plants can alter habitat structure, decrease availability of water, and ultimately disrupt the functionality of native plant communities, including soil structures, biology, and function. Nonnative and invasive plants are further discussed in Section 3.9.

The analysis area does not contain farmland of statewide importance, and there are no areas that have been identified as prime farmland, unique farmland, or prime farmland if irrigated and reclaimed of

excess salts and sodium. The proposed Project would not impact designated farmlands. Microbial soil crusts are not abundant in the area, would be less than 10% coverage in small, isolated areas associated with black sage and Wyoming big sagebrush plants, and have not been indicated to be a sensitive resource by the BLM as necessitating protection measures within the analysis area.

3.4.2 Environmental Consequences

3.4.2.1 Analysis Method

The analysis area for impacts to soils consists of the HUC-12 subwatersheds within which the proposed mining activities would occur for the alternatives being considered. The total impact areas (acreage) directly disturbed comparatively between alternatives is used as a proxy for the level of impact to soils, as well as qualitative impacts, such as changes to soil quality/health, compaction, and salinity. It is assumed that disturbances to soils increases their susceptibility to erosion. Highly erodible soil types have increased erosion rates. Long-term productivity of soil is decreased as the soil profile erodes. The area (acreage) of soils with a K factor greater than 0.4 is used as an indicator for level of impact from water erosion, and the area (acreage) of soils with a wind erodibility index value greater than 55 is used as an indicator for level of impact from wind erosion.

In general, for soil salvage, topsoil with sodium absorption ratio (SAR) levels 10 to 15 (or 10–12 where clay is greater than 40%) are marginal due to increased levels of exchangeable sodium, which affects plant rooting depth, plant growth, and plant available water. Levels greater than 15 are generally considered unsuitable (Wenck 2021), although this varies on a site-specific basis and depends on multiple factors, such as types of target vegetation for revegetation and planting method (seeding versus planting). For the Project, it is assumed that soils with levels up to 30 SAR can be salvaged and revegetated based on previous input from the Wyoming DEQ regarding site-specific observations where existing native vegetation is established with corresponding SAR ranges (Wenck 2021). However, in all cases, soils would need to be analyzed on a site-specific level, stockpiled separately based on salt content, pH, and rock content, with particular attention to soil map units 15 to 30 SAR in the surface or subsurface. The revegetation plan, included in the Mine Plan, would focus on native species and BLM-approved seeding mix, soil treatments (including soil stockpiling methodology), details on existing SAR ranges across the Project footprint, and suitability for soil salvage and revegetation.

The proposed Project would not impact designated farmland of statewide importance, areas that are prime farmland, unique farmland, or prime farmland if irrigated and reclaimed of excess salts and sodium, because these resources do not exist in the analysis area. The Project would not impact areas with soil biotic crust, because soil biotic crusts are uncommon in the analysis area (less than 10% cover within sage and Wyoming big sagebrush plant communities). Therefore, these soil resources are not included further in this analysis.

3.4.2.2 Alternative A (No Action)

Under the No Action Alternative, no additional expansion onto BLM- or USFS-administered lands would occur. No ground disturbance would occur, and there would be no changes or alterations to the landscape; therefore, there would be no impacts to soil resources. Existing conditions and trends in the analysis area would continue.

3.4.2.3 Alternative B (Proposed Action)

Activities that would impact soils during construction disturbance, operations, and reclamation include pipeline and transmission line construction, existing and new road footprints, holding ponds and well pad

construction, and direct disturbance from active mining operations, topsoil salvage and stockpiling, topsoil placement over recontoured and capped/reclaimed facilities, soil amending, seedbed preparation, and seeding and revegetation. Vegetation removal and surface disturbance within these areas would expose soils to wind and water erosion and lead to soil loss and soil degradation until restoration, reclamation, and revegetation occurs. Construction of new roads and mining operation areas that would be installed and used for the entire duration of the Project would result in direct impacts to soils and removal of these areas for natural processes and soil functions, such as stormwater infiltration, percolation, retention, amelioration, and filtration. The relative magnitude of direct impact to soils would vary between the Proposed Action and the alternatives based on acreage of the Project footprint and type of disturbance, as summarized in Table 2.4-1. Construction of infrastructure, such as the pipeline, utilities, and temporary construction access routes, would have a shorter duration of impact and would be restored immediately upon completion of the construction phase. Soil functions could be restored through restoration, stabilization, and revegetation activities, which typically include a 5-year monitoring period within which revegetation and stabilization would be monitored for success after completion of construction. Besides surface stabilization, subsurface soil functions can take up to and more than 20 years to fully restore, particularly if soil structure is impacted from compaction.

Overall, the Proposed Action and all alternatives would result in soil disturbance on less than 1.52% of the 460,668-acre analysis area (HUC-12 subwatersheds), within which the proposed mining activities would occur. This disturbance would lead to loss of soils in the Project area from both water and wind erosion despite implementation of BMPs and other erosion control strategies. The overall disturbance area for Alternative B represents approximately 1.37% of the analysis area, indicating a relatively small impact area to soil resources and properties within the context of the larger watershed areas. Comparatively, this is slightly less than impacts from Alternative C (impact of 1.39%) and less than Alternative D (impact of 1.52% within analysis area).

Table 3.4-2 presents the K factor and wind erodibility rating (WER) summarized across the impact area for Alternative B. Table 3.4-3 summarizes the magnitude of potential impact based on soil erodibility properties for the proposed Project and compares all alternatives. Approximately only 3% of the disturbance area under Alternative B contains soils with K factors that are greater than 0.4, as presented in Table 3.4-3, which indicates relatively low potential for disturbance associated from water erosion, which is generally comparable to Alternatives C and D. Areas of high wind erodibility index (WER > 55) make up 94% of the Project footprint for Alternative B, yet this still makes up a very small proportion of the analysis area (< 1%). Depending on the alternative selected, 94% to 97% of the impact area is considered moderate to high for wind erodibility (WER > 55). The Project footprint is much more susceptible to wind erosion; therefore, substantial soil loss and degradation could occur if the surface is not kept moist or stabilized (by water truck or other measures) and if revegetation does not occur in a timely manner. Although water erosion would also contribute to soil loss and degradation, it would be less of a factor as the majority of the impact area (97%) falls within the low water erosion potential category (0.4 or less).

Table 3.4-2. Soil Erodibility Properties for Alternative B

K Factor	Area (acres)	Wind Erodibility Rating	Area (acres)
0.00–0.02	0	48	173
0.02–0.30	5,430	56	277
0.31–0.40	496	86	1,214
0.41–0.50	197	134	4,444
0.51–0.64	0	250	13
Undefined	198	Null	201

K Factor	Area (acres)	Wind Erodibility Rating	Area (acres)
Total	6,322		6,322

Source: NRCS (2023b).

Notes: Numbers in table above are approximate, and acreages overlap. *Undefined* or *Null* in the dataset means area not mapped/no data (sometimes due to being open water, bed rock, or other unusual conditions).

Table 3.4-3. Summary of Soil Properties and Impacts by Project Action Alternatives

Soil Properties	Alternative B (Proposed Action)		Alternative C		Alternative D	
	Area (acres)	Percentage of Project Footprint	Area (acres)	Percentage of Project Footprint	Area (acres)	Percentage of Project Footprint
K factor over 0.4	197	3.1%	178	2.8%	178	2.5%
WER over 55	5,947	94.1%	5,999	94.0%	6,797	97.0%
Total Project footprint	6,322		6,387		7,012	

Source: NRCS (2023b).

Notes: Numbers in table above are approximate. Acreages in table have overlap and do not add up to total footprint.

The Project includes measures to minimize impacts to soils, primarily through identifying suitable soil for salvage and stockpiling of topsoil for reuse during restoration of utility and pipeline areas immediately after construction, and through the overall reclamation of the direct impact areas after Project operations are complete. Below the existing root zone, soil organic matter, soil organic carbon, pore space, and soil microorganisms are reduced or absent and the mixing of soil materials (if this accidentally occurred) would dilute the topsoil and could add additional salts that are higher in content in the subsoil horizons. If suitable soil areas and soil layers for stockpiling and reuse for plant reseeding bed are not carefully identified through sampling and detailed mapping, success in reestablishing vegetation would likely be reduced, which would affect final reclamation of the site. Careful reclamation planning for topsoil stripping/salvage and stockpiling for reuse would ensure suitable growth medium is available at the time of future mine closure. For topsoil salvage and reuse, SAR, pH, coarse fragment content, and depth of available soil are the limiting and driving features that determine suitability. A summary of general SAR levels based on soil map units within the Alternative B disturbance area (Table 3.4-4) and based on information from the Web Soil Survey (NRCS 2023b) shows that, in general, most surface soils would be suitable for reuse in regard to SAR, but soil depth, soil layers, pH, and rock fragment content would need to be determined on a site-specific soil mapping basis during soil salvage planning. Previous soil mapping for portions of the Project area has shown available soil thickness of suitable soils for topsoil salvage by each map unit, and depths have generally ranged from 4 inches to 12 inches, yet for some soil map units, the suitable soil may be up to 30 inches in depth. This previous mapping effort also determined, in general, that the A, E, and non-sodic B horizons are likely suitable for topsoil salvage (Wenck 2021). However, in the deeper soils, there may be other limiting factors, such as pH, SAR, high rock content (low mineral soil content), and/or confining layers that necessitate separating soils out by depth when stockpiling so as not to mix in less suitable soil properties with more ideal soils. Also, usually the top 12 inches of a soil would have a higher likelihood of suitable organic content, microorganisms, and soil pores, which would be supportive of future revegetation efforts, whereas deeper soils may be limiting in such conditions. In all cases, soils would need to be carefully sampled within the Project footprint (if it has not already been completed), mapped, and separated based on their soil properties when stockpiling. If it is determined that less than 12 inches depth of soil is suitable for salvage, careful consideration of methods for salvage would be needed.

Table 3.4-4. Alternative B Summary of Sodium Absorption Ratio in Soils

Sodium Absorption Ratio Range	Area (acres)	Percentage of Impact Area
< 10	5,984	94.7%
10–15	13	0.2%
> 15	324	5.1%
Null	198	3.1%
Total Project footprint	6,322	

Source: NRCS (2023b).

Notes: Numbers in table above are approximate, and acreages overlap. *Undefined* or *Null* in the dataset means area not mapped/no data (sometimes due to being open water, bed rock, or other unusual conditions).

Pacific Soda would salvage suitable topsoil, creating temporary stockpiles to store the topsoil until needed for reclamation. BLM stipulations require salvage of a minimum of 6 inches of topsoil for all surface-disturbing activities unless the physical and/or chemical properties of the soil are such that salvage of that amount of topsoil is not warranted. Areas unsuitable for soil salvage include areas that lack topsoil, such as rock outcrops, steep escarpments, and perennial or ephemeral drainages where topsoil has washed away and areas with high rock fragment content make the soil salvage infeasible and material unusable as planting medium. A site-specific soil survey and salvage plan would need to be developed for the area of impact to define areas and depths of soils suitable for salvage, to inform contractors of areas feasible and suitable for soil salvage, and to designate areas that are deemed inappropriate for soil salvage, such as areas where shallow depth to rock fragment or bedrock are present or areas with high salt content that are not suitable as a seedbed for revegetation. If the soil salvage plan determines that there is not enough topsoil present on-site to use for the final reclamation area(s), a second tier of less suitable topsoil and/or subsoil can be stockpiled and segregated to be used on a lower priority for reuse in restoration, reclamation, and revegetation activities. Calcium amendments, such as gypsum, have the potential to mitigate sodic soils, but only when enough water is supplied to leach out the sodium cations; therefore, this type of soil amendment is not likely feasible for a project of this scale. The soil salvage plan would ensure that different qualities and types of soil salvaged are stockpiled and managed separately and would be available during reclamation and restoration of the site.

The BLM stipulates that topsoil piles would be seeded with BLM-approved seed mix or erosion control devices would be installed within 6 months of the initial disturbance. Suitable soil would be stockpiled as berms along linear features, such as access roads, and in larger piles near non-linear features, such as adjacent to the operating facilities area. Each type of facility has specific plans for reclamation that generally include hydrologic isolation of acid-creating materials accomplished through surface water drainage diversions and material capping, contouring of exterior slopes for stability, and placement of salvaged topsoil for growth media. The stockpiles would be seeded with fast-growing ground covers that would establish cover and roots for erosion control.

As long-term reclamation progresses and the end of mine life approaches, the soil stockpiles would be redistributed as growth media into decommissioning areas. Once ready for final reclamation, the soil would be prepared through amendments (if, and where, deemed necessary), including loosening and roughening of the impacted areas. Stockpiled soil would then be spread across the surface. The soil would be re-seeded with BLM-approved seed mixes for final reclamation. Areas of final reclamation would be subjected to current reclamation standards. Criteria would include decompaction, establishment (types, densities, self-propagation) of desired vegetative cover, monitoring of noxious weeds, and implementation of effective erosion control measures. Detailed plans for soil salvage, decompaction, revegetation, erosion control, and monitoring would be included in Pacific Soda's reclamation plans once

an alternative is selected and once grading footprint and final plans are developed for the anticipated impact and restoration areas.

Salvage, stockpile, and storage of topsoil and other suitable soils for later use in capping and reclaiming disturbed areas, coupled with revegetation of stockpile areas and construction and operation impact areas, should help to offset short-term losses directly resulting from disturbance under all action alternatives, as long as revegetation and stabilization methods are implemented in a timely manner after disturbance occurs (either immediately after construction for construction-related impacts or during reclamation at the end of operations). Water would be applied to disturbed areas during construction, as well as on roads during operations, to minimize wind erosion and topsoil loss. Water trucks may use additional tackifiers to increase surface stabilization, as allowable within regulatory and legal context. The water would be applied in a manner to avoid runoff and ensure that tackifiers, if used, remain on the road surfaces and the mining operation footprint and do not run off-road.

3.4.2.4 Alternative C

Overall, all alternatives would result in soil disturbance in less than 1.52% of the analysis area (HUC-12 subwatersheds) within which the proposed mining activities would occur. The overall disturbance area for Alternative C would represent approximately 1.39% of the analysis area, would have a slightly larger footprint than Alternative B (only +66 acres), and would be smaller than Alternative D. This acreage difference is a relatively small difference between all three alternatives. All alternatives have relatively low water erosion potential with only 3% or less of the impacts occurring on soils with K factor over 0.4, which is the threshold for higher water erosion potential. Table 3.4-5 presents the soil erodibility properties for Alternative C, and Table 3.4-3 summarized soil properties and impacts across all action alternatives. Alternative C has a similar proportion of soils with high wind erosion potential (WER > 55) when compared to Alternative B (94%), and slightly lower area than Alternative D (97%). In general, surface soil suitability for reuse in regard to SAR would be similar when compared to other alternatives, as presented in Table 3.4-6.

Table 3.4-5. Soil Erodibility Properties for Alternative C

K Factor	Area (acres)	Wind Erodibility Rating	Area (acres)
0.00–0.02	0	48	164
0.02–0.30	5,477	56	281
0.31–0.40	512	86	1,222
0.41–0.50	178	134	4,481
0.51–0.64	0	250	16
Undefined	220	Null	224
Total	6,387		6,387

Source: NRCS (2023b).

Notes: Numbers in table above are approximate, and acreages overlap. *Undefined* or *Null* in the dataset means area not mapped/no data (sometimes due to being open water, bed rock, or other unusual conditions).

Table 3.4-6. Alternative C Summary of Sodium Absorption Ratio in Soils

Sodium Absorption Ratio Range	Area (acres)	Percentage of Impact Area
< 10	6,040	94.6%
10–15	16	0.3%

Sodium Absorption Ratio Range	Area (acres)	Percentage of Impact Area
> 15	113	1.8%
Null	217	3.4%
Total	6,387	

Source: NRCS (2023b).

Notes: Numbers in table above are approximate, and acreages overlap. *Undefined* or *Null* in the dataset means area not mapped/no data (sometimes due to being open water, bed rock, or other unusual conditions).

3.4.2.5 Alternative D (Preferred Alternative)

Table 3.4-7 presents the soil erodibility properties for Alternative D. Overall, all alternatives would result in soil disturbance of 1.37% to 1.52% of the analysis area (HUC-12 subwatersheds) within which the proposed mining activities would occur. The overall disturbance area for Alternative D is slightly larger compared to Alternatives B and C and represents approximately 1.52% of the analysis area. Alternative D has slightly higher acreage when compared to the other alternatives with high wind erosion potential (WER > 55) for a total of 97% of the Project footprint. In general, surface soil suitability for reuse in regard to SAR is similar when compared to other alternatives, as presented in Table 3.4-8.

Table 3.4-7. Soil Erodibility Properties for Alternative D

K Factor	Area (acres)	Wind Erodibility Rating	Area (acres)
0.00–0.02	0	48	178.52
0.02–0.30	6,475	56	106.98
0.31–0.40	322	86	2,565.31
0.41–0.50	178	134	4,124.90
0.51–0.64	0	250	0.00
Undefined	36	Null	36.04
Total	7,012		7,012

Source: NRCS (2023b).

Notes: Numbers in table above are approximate, and acreages overlap. *Undefined* or *Null* in the dataset means area not mapped/no data (sometimes due to being open water, bed rock, or other unusual conditions).

Table 3.4-8. Alternative D Summary of Sodium Absorption Ratio in Soils

Sodium Absorption Ratio Range	Area (acres)	Percentage of Impact Area
< 10	6,815	97.2%
10–15	4	0.1%
> 15	157	2.2%
Null	36	0.5%
Total	7,012	

Source: NRCS (2023b).

Note: Numbers in table above are approximate, and acreages overlap. *Undefined* or *Null* in the dataset means area not mapped/no data (sometimes due to being open water, bed rock, or other unusual conditions).

3.4.2.6 *Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity*

Mine construction and operations that occur on previously undisturbed soil would create an irretrievable impact to the existing soil structure and functions. There is also a small potential for water erosion, all of which would last until soil is stabilized, reclaimed, and begins the natural process to form a new structure (soil structure could take approximately 20 years, or more, after reclamation activities are implemented). Topsoil would be salvaged, reclaimed, and reapplied to limit loss of topsoil through water erosion. With successful reclamation, these irretrievable impacts would not be permanent or irreversible. In regard to net soil loss from wind erosion, there is potential for irreversible impacts, because once soil is lost from the site it cannot be returned to the site; however, this loss would be minimized throughout the construction and operations phases of the Project. In regard to disturbance caused by underground infrastructure and utilities, soil properties would be reclaimed faster than for disturbance caused by aboveground facilities, as once the infrastructure is constructed and buried, restoration could be conducted to reestablish natural contours, replace salvaged native topsoil, and revegetate the disturbed area (typically a 5-year period for vegetation to reestablish and an additional 5 years for soil properties to be restored). The relatively low proportion of the Project disturbance area relative to overall soil resources within the HUC-12 subwatershed analysis area combined with reclamation would ameliorate impacts to the long-term sustainability and overall productivity of soil resources in the impacted watersheds. Within the context of the HUC-12 subwatersheds, overall productivity could be retained, as the system could absorb the disturbance, and adjacent areas would continue to function. The area would continue to percolate, infiltrate, and filter stormwater and provide for groundwater recharge. Other soil processes and ecosystem services would continue to function in the greater context beyond the Project footprint.

3.4.2.7 *Cumulative Impacts*

There are reasonably foreseeable trends and future actions within the analysis area that may impact the same community types impacted by the construction and operations of the Project described herein (including soil resources). Ongoing landscape-scale phenomena and activities, such as climate change, drought, and surface-disturbing activities could lead to further strain, encroachment, alterations, and/or degradation to soil resources relative to an intact sustainable and functioning soil ecosystem in the analysis area over time. Nearby planned actions that would also disturb soils (based on disturbance area acreage, as a proxy for soil disturbance), particularly in areas with high wind or water erosion potential and saline soils, have the potential to compound impacts from the Project. Wherever there is surface disturbance or alteration from other planned actions near the Proposed Action, there is potential for landscape-scale impacts to soils; however, the severity of said impacts depends on the proximity of the planned action to the Proposed Action, the sensitivity of the site-specific conditions where impacts are occurring, the scale of disturbance, and other biotic and abiotic factors.

The RFFAs listed in Appendix E with the potential to impact soils include any actions that would remove surface vegetation, disturb soils, and/or create the potential for soil erosion and subsequent sedimentation. The total amount of estimated disturbance associated with the RFFAs in Appendix E is approximately 43,603 acres within the analysis area. At this time, it is not possible to determine the exact amount of soil disturbance associated with each RFFA; therefore, this analysis takes a conservative approach and assumes 43,603 acres of disturbance in addition to the Proposed Action disturbance of approximately 6,322 acres (maximum). When combined with RFFAs, the total soil disturbance would be approximately 49,925 acres, or 11% of the 460,668 acres in the analysis area.

This estimate does not include all lands in the analysis area administered by the BLM, USFS, Wyoming Department of Transportation (WYDOT), or other agencies that are listed as eligible for mining, grazing, vegetation treatments for noxious or invasive species, fuel reduction, watershed restoration and habitat

improvement, and transportation improvements. Even though these large management areas may be eligible for treatment and permitted projects, such as mining, grazing and vegetation treatment, the specific portions of each area that may be treated in any given year would be determined on a case-by-case basis and would only involve small fractions of the larger managed areas. Also, it is unknown how many of these future actions may occur on highly erodible or saline soils because Project-specific conditions and potential impacts have not yet been identified. The current BLM Kemmerer and Rock Springs RMPs and the USFS Ashley LMP require specific stipulations for site-specific projects to prevent cumulative long-term loss of soils or soil productivity through disturbance and subsequent erosion.

3.5 Water Resources

Water resources include both groundwater and surface water features. Groundwater resources include groundwater within aquifers, aquitards, and within the various groundwater recharge pathways. Surface water features include streams (perennial, intermittent, and ephemeral), springs, wetland areas, and floodplains. The potential impacts of the Project on both groundwater (quantity and quality) and surface systems are evaluated and discussed in this section.

3.5.1 Affected Environment

The Project is located within the Greater Green River Basin (Basin), which covers approximately 20,000 square miles of the central Rocky Mountains in southwestern Wyoming, northeastern Utah, and northwestern Colorado. An extensive portion of the Basin is characterized by badlands, rims, and plateaus. The relief of the badlands is typically low and may range from 100 feet to a maximum of 1,200 to 1,500 feet (Bradley 1964). Surface elevations range between approximately 6,000 and 9,500 feet above mean sea level (amsl). Weather data for Rock Springs, Wyoming, show that the average annual high temperature is 55°F. The monthly average high occurs in July (84°F). The average annual low temperature is 32°F. The monthly average low occurs in January (13°F). Average annual precipitation is approximately 8.56 inches, and the average annual snowfall is between 25 and 29 inches.

3.5.1.1 Geology

The Basin is bounded by the Wind River Mountains and Sweetwater Arch (Granite Mountains) to the north, the Rawlins Uplift and Sierra Madre Range to the east, the Uinta Mountains to the south, and the Wyoming Thrust Belt to the west (Roehler 1992a). The Basin is divided into four subbasins by intra-basin anticlines. The largest anticline, trending north-south through roughly the center, is the Rock Springs uplift, which divides the Basin into two halves (east and west). The west half comprises the GRB—approximately 10,500 square miles—and the Project lies within it. The east half comprises the Great Divide, Washakie, and Sand Wash Basins. The structural framework of the Basin formed during the Laramide orogeny near the end of the Cretaceous Period, over approximately 30 million years ago (Roehler 1992a). Eocene sedimentation occurred throughout the Laramide Orogeny. Since the end of the Eocene Epoch, the Basin has been only slightly modified by regional uplift, normal faulting, volcanism, and erosion (Roehler 1992a).

The Eocene rocks within the GRB are particularly relevant to the Project. These rocks include (from the bottom up): Wasatch Formation, Green River Formation, and the Bridger Formation. The three formations are distinguished by their distinctive lithologies, which are based on their depositional environments. Both the Wasatch and Bridger Formations are fluvial, whereas the Green River Formation is considered lacustrine (Roehler 1992b).

Wasatch Formation

The Wasatch Formation is the first of the three units deposited in the stratigraphic sequence. Wasatch strata are fluvial in nature and are composed of red and gray shale and siltstone, and massive, irregularly bedded fine-to-medium gray-to-brown sandstone containing a few thin lenticular conglomerates. The sandstones are predominantly quartz but contain some feldspar and other minerals. Wasatch strata are irregular, facies-based, and discontinuous, but some zones of sandstone or shale within the formation can be traced for several miles. The Wasatch Formation was deposited on flood plains and in streambeds and deltas near the edge of Lake Uinta to the south of the Uinta Mountains (Cashion 1967) and near the edge of Lake Gosiute to the north of the Uinta Mountains (Roehler 1992b). Much of the Wasatch and Green River Formations were deposited concurrently with the Wasatch Formation near the edge of Lake Gosiute, a widespread shallow Eocene inland lake, and the Green River Formation was deposited directly from Lake Gosiute (i.e., lacustrine). For this reason, the Wasatch and Green River Formations inter-tongue one another. The Wasatch thickness generally ranges from 3,500 to 4,500 feet (Wenck 2020a).

Green River Formation

The Green River Formation was deposited by Lake Gosiute. Lake Gosiute underwent three major phases of development, each of which correspond to a member of the Green River Formation. Major units, from the bottom up, include the Tipton Shale, Wilkins Peak, and Laney Shale Members (Wenck 2020a). Volcanic tuff was deposited directly into the lake in addition to tuffaceous sediments, which were washed into the lake from surrounding drainage basins. These tuffaceous sediments, which account for approximately 5% of the total sediment in the formation, readily decomposed in the alkaline lake waters and likely provided some of the dissolved sodium and other cations that compose some of the carbonate minerals found in the Green River Formation (Wenck 2020a).

The Tipton Shale Member consists almost entirely of oil shale with several thin persistent beds of altered tuff, locally containing beds of marlstone and claystone (Wenck 2020a). The Tipton is the thickest unit in the southeastern part of the basin, where it generally ranges from 130 to 200 feet thick. This unit represents freshwater deposition in Lake Gosiute when algae in the lake flourished and their remains, together with clastic sediments and authigenic minerals, formed organic marlstones and beds of oil shale (Wenck 2020a).

The Wilkins Peak Member was deposited when Lake Gosiute receded and its outlet closed, causing evaporation to exceed water supply (Wenck 2020a). The bulk of Wilkins Peak sediments consist of thin persistent beds of oil shale, marlstone, claystone, trona or trona-halite, limestone, and tuff with a maximum thickness of 1,300 feet in the southeastern part of the Basin. During arid periods, the lake became sufficiently saline to precipitate large quantities of sodium salts, either directly from the lake waters or interstitially from briny water within the sediments (Wenck 2020a). These processes allowed for the development of economic quantities of the mineral assemblage trona. As many as 42 nearly flat-lying beds of trona were identified by Burnside and Culbertson (1979), who numbered the thickest and economically most important of these beds from 1 to 25 in ascending order. Bed 1 is the lowest bed and lies immediately above the Tipton Shale Member (Wenck 2020a).

The Laney Shale Member is the last member of the Green River Formation and was deposited during a period when Lake Gosiute enlarged and was a freshwater lake. Beds of the Laney Member consist of laminated oil shale, marlstone, sandstone, and mudstone, with minor beds of limestone and tuff. The Laney has a maximum thickness of approximately 1,050 feet in the southern part of the GRB and thins northward by interfingering with, and being replaced by, stream-deposited beds of the Bridger Formation. Shortly after the initiation of Laney deposition, fluvial deposits encroached on Lake Gosiute from the

north. Lake Gosiute retreated southward and disappeared at the beginning of the Bridger Formation deposition (Wenck 2020a).

Bridger Formation

The Bridger Formation is the youngest unit exposed at the surface and consists of gray and green sandstone and mudstones. Interbedded with the sandstone and mudstone are thin beds of conglomerate, limestone, shale, siltstone, tuff, and rare thin beds of carbonaceous shale, carbonaceous siltstone, and oil shale. These units are of fluvial origin and contain large amounts of reworked and disseminated volcanic ash. The maximum recorded thickness of the Bridger Formation is approximately 2,000 feet (Cashion 1967).

3.5.1.2 *Surface Water*

The Green River is the largest surface water feature in the region. Surface water within the GRB ultimately flows to the Green River. The Project lies within the Big Dry Creek HUC10 watershed. This watershed is approximately 413 square miles and drains to the Blacks Fork River as it enters Flaming Gorge Reservoir and the Green River. The Blacks Fork River, Green River, and Flaming Gorge Reservoir are Class 2AB waters designated for drinking water, cold-water game fish, nongame fish, aquatic life other than fish, recreation, agriculture, industry, wildlife, and scenic value uses. The catchments within the Project area either drain to the north into Little Dry Creek or to the south into Big Dry Creek. Little Dry Creek and Big Dry Creek are ephemeral with flow occurring only in the spring from snow runoff or from major precipitation events. Big Dry Creek, Little Dry Creek, and various unnamed drainages in the Project area are Class 3B waters designated for aquatic life other than fish, recreation, agriculture, industry, wildlife, and scenic value uses. Measured flows in the catchments across Section 27 ranged from 5 to 20 gallons per minute (0.011–0.045 cfs) in the spring and early summer of 2019 (Wenck 2020b).

Green River Water Rights

Pacific Soda has obtained water rights to divert 20 cfs from the Green River. The point of diversion is just southeast of the City of Green River, Wyoming. The water would be transmitted through a pipeline from the point of diversion to the Project mining and processing area, approximately 20 miles to the southwest. To understand the impacts of diverting 20 cfs from the Green River, flow along this stretch of the Green River was analyzed.

Between the Fontenelle Reservoir and the Project point of diversion, the Wyoming State Engineers Office reports a total of 177 active points of diversion. The total allocated withdrawal across this reach of the river is 629 cfs. This total excludes the two points of diversion for the Fontenelle Powerplant Pipeline (each 1,924 cfs), as it is assumed this water is not consumed but returned to the river at the point of diversion. The Pacific Soda water right of 20 cfs represents approximately 3% of the total appropriations along this stretch of the Green River.

Green River Flow Near Pacific Point of Diversion

Initially, the measured Green River flows from two USGS gages just upstream (2.0 and 4.5 miles upstream) of the Pacific Soda point of diversion were analyzed (Appendix Q, Figure 3.5-1). These data are considered together due to the gages' proximity to each other and to the Project point of diversion. Hydrographs for both gages (USGS gages 9217000 and 9216500) are presented below on Figure 3.5-2 (Appendix Q). Average annual flow was 2,048 cfs from 1895 through 1920. Average monthly flow rates for this timespan are shown on Figure 3.5-2 (Appendix Q) and listed in Table 3.5-1. Baseflow for the period (381 cfs) was estimated as the average of the two lowest, average monthly flow rates (January and

February). Over the next couple of decades (1921–1939) the annual average flow rate for the period decreased by approximately 18% to 1,686 cfs, and the estimated baseflow increased slightly to 409 cfs. As estimated by fitting a linear trend line through the average, annual flow rates from 1895 through 1939, Green River flows decreased by approximately 17 cfs each year during this time period (Appendix Q, Figure 3.5-1).

Water Quality

The potential for impacts to water quality of surface waters in the Project area, or in proximity to the Project area, would be limited to surface waters receiving stormwater runoff from the Project area. Surface waters in proximity to the Project area include Big Dry Creek (Class 3B), Little Dry Creek (Class 3B), and various unnamed drainages through the Project area (Class 3B), Black Forks River (Class 2AB), Green River (Class 2AB), and Flaming Gorge Reservoir (Class 2AB). Any construction development would follow a stormwater management plan to help mitigate impacts.

Annual average flow between 1921 and 1939 was 1,686 cfs. Between 1951 and 1964, the annual average flow decreased by approximately 8% to 1,555 cfs. Baseflow increased from 409 to 458 during the aforementioned time periods. In the early 1960s, Fontenelle Reservoir was constructed on the Green River approximately 50 miles upstream of the point of diversion. Since the beginning of 1964, the flow of the Green River has been regulated by releases from the reservoir. From 1965 to 1989, baseflow increased significantly to approximately 772 cfs and then to 956 cfs from 1990 to 2020. The average annual flow between 1965 and 1989 increased to 1,834 cfs. Recently (1990–2020) the average annual flow decreased to 1,451 cfs. During this time period, river flows at gage 09217000 have decreased on average by 3 cfs per year, based on a linear trend line through the average annual flow rates (Appendix Q, Figure 3.5-1).

The Pacific Soda water right (Project point of diversion on the Green River) is for 20 cfs, which is approximately 1.4% of the annual average flow (average annual flow of 1,451 cfs) or approximately 2.1% of the estimated baseflow (baseflow of 956 cfs). Assuming a 3 cfs decrease in annual flow each year over the life of the Project (30 years), annual average flow in the Green River would decrease by 90 cfs and average annual flow would decrease from 1,451 to 1,361 cfs. At the end of the Project, Pacific Soda withdrawals would account for approximately 1.5% of the annual average flows.

3.5.1.3 *Groundwater*

Hydrostratigraphy

The regional hydrogeology of the GRB consists of three aquifers and two confining units (Clarey et al. 2010; Martin 1996). The aquifers are composed of saturated portions of the Bridger Formation, Laney Member of the Green River Formation, and the main body of the Wasatch Formation. The Wilkins Peak and Tipton Shale Members of the Green River Formation constitute confining units. The Bridger and Laney aquifers are separated from the Wasatch aquifer by approximately 1,000 feet of shales, siltstones, oil shales, evaporites, and marlstones (Wilkins Peak and Tipton Shale Members). Neither the Wilkins Peak nor Tipton Shale confining units are water producing near the Project. In situ recovery (ISR) mining, as detailed in Appendix C, would take place in the lower section of the Wilkins Peak and immediately above the Tipton. Descriptions of each hydrogeologic unit are provided in the subsections below, and a summary is included in Table 3.5-2.

Table 3.5-1. Calculated Monthly and Annual Averages for Two Gages Over Five Time Periods

Month	USGS Gage: #09216500 Date Range: 1895–1939 Average Flow (cfs)	USGS Gage: #09216500 Date Range: 1921–1939 Average Flow (cfs)	USGS Gage: #09217000 Date Range: 1951–1964 Average Flow (cfs)	USGS Gage: #09217000 Date Range: 1965–1989 Average Flow (cfs)	USGS Gage: #09217000 Date Range: 1990–2020 Average Flow (cfs)
January	376	391	445	776	983
February	387	427	534	876	983
March	663	917	847	1,080	1,125
April	1,642	1,860	1,651	1,815	1,284
May	3,827	3,464	2,887	2,778	1,882
June	8,209	5,833	5,463	5,044	3,641
July	4,897	2,982	2,977	3,678	2,336
August	1,842	1,405	1,283	1,772	1,298
September	990	864	753	1,407	964
October	716	819	717	1,099	957
November	583	666	632	914	959
December	444	479	472	769	955
Annual average	2,048	1,686	1,555	1,834	1,451
Estimated baseflow	381	409	458	772	956

Table 3.5-2. Hydrogeologic Units

Hydrogeologic Unit	Description	Recharge and Discharge Description	Hydraulic Properties	
			Hydraulic Conductivity	Storage Properties
Bridger Aquifer	Comprises the Bridger Formation. Fluvial in origin. Gray and green sandstone and mudstones. Approximately 2,000 feet thick.	Recharge is from precipitation infiltration along the southern boundary of the GRB near the Uinta Mountains. Discharge is primarily to Henrys Fork and the Green River.	0.03–4.23 feet per day (feet/day) (Clarey et al. 2010)	Storativity: 4×10^{-5} (Clarey et al. 2010)
Laney Aquifer	Comprises the Laney Member of the Green River Formation. Laminated oil shale, marlstone, sandstone, and mudstone. Deposited during a freshwater episode of Eocene Lake Gosiute. Maximum thickness is 1,050 feet.	Recharge is from infiltration of excess irrigation in the Farson-Eden area and from infiltration through the Bridger along the southern boundary of the GRB near the Uinta Mountains. In the northern GRB, the Wasatch may flow into the Laney and recharge it. Discharge is primarily to the Green River and Flaming Gorge Reservoir.	0.2–1,450 feet/day (Clarey et al. 2010)	Storativity: 5×10^{-4} to 8×10^{-3} (Clarey et al. 2010)
Wilkins Peak Confining Unit	Comprises the Wilkins Peak Member of the Green River Formation. Oil shale, marlstone, claystone, trona or trona-halite, limestone, and tuff. Deposited during saline episodes of Eocene Lake Gosiute. Maximum thickness is 1,300 feet.	N/A	9×10^{-5} feet/day (Groundwater Model [Martin 1996])	N/A
Tipton Shale Confining Unit	Comprises the Tipton Shale Member of the Green River Formation. Almost entirely oil shale with several thin beds of altered tuff. Deposited during a freshwater episode of Eocene Lake Gosiute. Thickness ranges between 130 and 200 feet.	N/A	0.05–11 feet/day (Clarey et al. 2010) 9×10^{-5} feet/day (Groundwater Model [Martin 1996])	Storativity: 3×10^{-5} (Clarey et al. 2010)
Wasatch Aquifer	Comprises the Wasatch Formation. Red and gray shale and siltstone and massive, irregularly bedded fine-to-medium, gray-to-brown sandstone. Fluvial in origin. Wasatch thickness is generally between 3,500 and 4,500 feet.	Recharge in the northern portion of the GRB is from infiltration of precipitation. Discharge is to the Green River and possibly recharge to the Laney aquifer.	0.03–2,106 feet/day (Martin 1996) 0.04–6.5 feet/day (Groundwater Model [Martin 1996])	Storativity: 1×10^{-9} to 1×10^{-3} (Clarey et al. 2010)

Note: N/A = not applicable.

Wasatch Aquifer

The Wasatch aquifer forms the base of the GRB Lower Tertiary aquifer (Clarey et al. 2010). The estimated extent and thickness of the Wasatch aquifer is shown on Figure 2-11 in the Groundwater Modeling Report (Appendix M). From the Project, the Wasatch aquifer extends approximately 25 miles to the east and south, 45 miles to the west, and more than 100 miles to the north (Appendix M, Figure 2-11). The Wasatch aquifer is approximately 3,000 feet thick in the Project area (Martin 1996; Wenck 2020a). Above the Wasatch aquifer are the Tipton Shale and Wilkins Peak confining units, which result in water within the Wasatch being under pressure. This is demonstrated by the artesian pressures observed in well WA-27-1, screened in the Wasatch aquifer, in the Project area. Martin (1996) estimated a potentiometric surface for the Wasatch (reproduced on Figure 2-12 in Appendix M).

The measured hydraulic conductivity of the Wasatch aquifer ranges from 0.03 to 2,106 feet per day (feet/day) (Martin 1996). The calibrated groundwater model produced by Martin (1996) used a hydraulic conductivity range of 0.04 to 6.5 feet/day.

Estimates of storativity of the Wasatch aquifer are limited. Clarey et al. (2010) reported a range of values from 1×10^{-9} to 1×10^{-3} . However, these estimates are for depths of up to approximately 1,000 feet, whereas the Wasatch aquifer is greater than 3,000 feet below ground surface (bgs) in the Project area, indicating that the storativity would likely be lower.

Tipton Shale Confining Unit

The Tipton Shale confining unit overlays the Wasatch aquifer. The extent and thickness of the Tipton Shale (estimated by Martin [1996]) are shown on Figure 2-10 (Clarey et al. 2010) in the Groundwater Modeling Report (Appendix M). From the Project area, the Tipton Shale extends approximately 74 miles to the north, 24 miles to the east, 27 miles to the south, and 35 miles to the west. Although the contoured thickness on Figure 2-10 in the Groundwater Modeling Report (Appendix M) in the Project area is between 50 and 100 feet, as measured by Wenck (2020a) in well WA-27-1, the Tipton Shale thickness is approximately 165 feet.

Clarey et al. (2010) reported a range of horizontal hydraulic conductivity for the Tipton Shale of 0.05 to 11 feet/day. This estimate is high compared to the value from the calibrated model reported by Martin (1996) of 0.00009 feet/day.

Clarey et al. (2010) reported a storativity of 3×10^{-5} . However, this estimate is for depths of up to approximately 1,000 feet, whereas the Tipton Shale is greater than 2,500 feet bgs in the Project area, indicating that the storativity would likely be lower.

Wilkins Peak Confining Unit

Overlying the Tipton Shale is another confining unit: the Wilkins Peak confining unit. The extent and thickness of the Wilkins Peak confining unit is shown in Appendix M, Figure 2-9 in the Groundwater Modeling Report. From the Project area, the Wilkins Peak extends approximately 74 miles to the north, 22 miles to the east, 24 miles to the south, and 36 miles to the west. In the Project area, the Wilkins Peak thickness is measured at 761 feet and 764 feet at WA-27-1 and CH-27-1.

Martin (1996) and Clarey et al. (2010) reported that vertical movement of water within the Wilkins Peak confining unit is extremely limited due to the trona and halite beds within the units. These units have been noted to be dry directly beneath the Green River (Clarey et al. 2010). Martin (1996) reported an estimated and modeled vertical hydraulic conductivity value of 9×10^{-5} feet/day. Wenck (2020a) reported that no

water was encountered within the trona beds in the Project area, providing further indication of the low permeability of the Tipton Shale and the Wilkins Peak above.

The targeted trona beds (Trona Beds 1–4) lie at the bottom of the Wilkins Peak member and directly overlie the Tipton Shale. The low permeability of the Tipton Shale below and the Wilkins Peak above the targeted beds contribute to the limiting migration of mining solution into the Wasatch aquifer (below) and the Laney aquifer (above).

Laney Aquifer

The Laney aquifer overlays the Wilkins Peak confining unit, and its extent and thickness (estimated by Martin [1996]) are shown in Appendix M, Figure 2-7 (Clarey et al. 2010) in the Groundwater Modeling Report. From the Project area, the Laney aquifer extends approximately 74 miles to the north, 25 miles to the east, 27 miles to the south, and 34 miles to the west. During drilling of WA-27-1, the Laney Member thickness was reported as 1,046 feet (Wenck 2020a) which coincides with the thickness as reported by Martin (1996) and shown in Appendix M, Figure 2-7 in the Groundwater Modeling Report. The potentiometric surface estimated by Martin (1996), as shown in Appendix M, Figure 2-8 in the Groundwater Modeling Report, is limited to the northern portion of the Laney aquifer because Martin (1996) reported that the southern portion of the Laney Member resembles a confining unit more than an aquifer. Martin (1996) went so far as to lump the southern portion of the Laney with the Wilkins Peak confining unit.

Clarey et al. (2010) reported that the hydraulic conductivity within the Laney aquifer ranges from 0.2 to 1,450 feet/day. Some aquifer testing of the Laney aquifer was performed in the study area and is discussed in Section 2.2.3.3 of the Groundwater Modeling Report (Appendix M). This lower range of hydraulic conductivity coincides with Martin's (1996) assertion that hydraulic conductivity in the southern portion of the basin is lower than in other portions. Storativity is estimated to be between 5×10^{-4} and 8×10^{-3} (Clarey et al. 2010).

Bridger Aquifer

The Bridger aquifer overlies the Laney aquifer and is the shallowest of the Eocene hydrogeologic units. The thickness and extent of the Bridger aquifer is shown in Appendix M, Figure 2-5 (Clarey et al. 2010) in the Groundwater Modeling Report. From the Project area, the Bridger aquifer extends approximately 44 miles to the north, 5 miles to the east, 26 miles to the east, and 36 miles to the west. The aquifer consists of fractured sandstones, shales, and tuffs and is estimated to be approximately 500 feet thick through the Project area (Martin 1996). Based on drilling in the Project area (wells LA-27-1, LA-27-2, LA-27-3, and WA-27-1), the thickness of the Bridger aquifer ranges between 516 and 545 feet (Wenck 2020a). Appendix M, Figure 2-6 in the Groundwater Modeling Report shows the estimated potentiometric surface in the Bridger aquifer (Martin 1996).

Clarey et al. (2010) reported a range of hydraulic conductivity from 0.03 to 423 feet/day with an estimate of storativity of 4×10^{-5} .

Water Quality

Solution mining of the ore body in the Wilkins Peak Formation has the potential to impact the quality of groundwater in the Project area. The Laney aquifer, overlaying the Wilkins Peak Formation, and the Wasatch aquifer, underlaying the Tipton Shale Formation, are both classified as Class IV A. In Wyoming, Class IV A Groundwater of the State is restricted to industrial use and contains water with total dissolved solids below 10,000 milligrams per liter. Groundwater modeling and particle tracking (discussed in

Section 3.5.2) indicates that solution mining water at the bottom of the Wilkins Peak Formation will not migrate into either the Laney or Wasatch aquifers.

Groundwater Budget

Recharge

Recharge to aquifers in the GRB occurs by infiltration of precipitation on outcrop areas, infiltration of snowmelt runoff from the mountains, and leakage of streamflow from tributaries of the Green River (Martin 1996). Recharge likely does not occur throughout the central portion of the basin because of the small average precipitation rates and large evapotranspiration rates (Martin 1996). Clarey et al. (2010) stated that precipitation in the GRB ranges from less than 7 inches per year in central basin areas to nearly 60 inches per year in the high mountain areas above 10,000 amsl. Wenck (2020b) indicated that the precipitation in the Project area is approximately 9 inches per year.

Martin (1996) and Clarey et al. (2010) both conclude that recharge occurs by infiltration of precipitation on outcrop areas. For the Wasatch aquifer, this occurs in the northern portion of the GRB (Appendix Q, Figure 3.5-3). The Laney aquifer is recharged from infiltration of excess irrigation in the Farson-Eden area (Clarey et al. 2010; Martin 1996). In the northern portion of the GRB, potentiometric contours between the Wasatch and Laney aquifers are continuous, which indicates that groundwater flow is not affected by the contact (Martin 1996) and that the Laney aquifer could be recharged from the Wasatch aquifer in the north. The Bridger aquifer is recharged from precipitation infiltration along the southern boundary of the GRB near the Uinta Mountains (Clarey et al. 2010; Martin 1996). The Laney Member along the Uinta Mountains is characterized as a conglomerate and may also receive recharge from above (the Bridger aquifer). Table 3.5-3 lists estimates of groundwater recharge from precipitation and runoff, infiltration of excess irrigation, and infiltration from streams (Martin 1996).

Discharge

Groundwater discharge from the GRB is primarily through discharge to the Green River, other streams and rivers, and to the Flaming Gorge Reservoir. Martin (1996) reported that groundwater pumping (wells) and evapotranspiration from groundwater is negligible. Clarey et al. (2010) noted that this may not be the case, as additional pumping in 2008 in the northern GRB was used to supply water to drill and supply gas wells to the Jonah Field and Pinedale anticline production areas. Table 3.5-3 and Table 3.5-4 lists the estimated groundwater inflow and discharge in the GRB (Martin 1996).

Table 3.5-3. Groundwater Budget for the Green River Basin – Inflow

Groundwater Recharge Component	Inflow to the Groundwater System	
	Cubic Feet per Second	Acre-Feet per Year
Infiltration or precipitation, snowmelt runoff, and streamflow	138	100,000
Excess irrigation water in the Farson-Eden, Wyoming area	18	13,000
Streamflow leakage along the Blacks Fork, Smiths Fork, and Hams Fork	9	6,500
Total	165	119,500

Table 3.5-4. Groundwater Budget for the Green River Basin – Outflow

Groundwater Discharge Component	Outflow from the Groundwater System	
	Cubic Feet per Second	Acre-Feet per Year
Green and New Fork Rivers upstream from Fontenelle Reservoir	94	68,000
Green River between Fontenelle Reservoir and the City of Green River, Wyoming	23	16,500
Green River downstream from the City of Green River, Wyoming, including Flaming Gorge Reservoir	13	9,500
Big Sandy River	17	12,500
Henrys Fork	16	11,500
Total	163	118,000

3.5.2 Environmental Consequences

3.5.2.1 Analysis Method

A calibrated three-dimensional numerical groundwater flow model was developed to estimate effects to groundwater and surface water resources. The numerical model was used to evaluate or estimate 1) drawdown and recovery from 2 years of pumping for water supply from the Wasatch aquifer and 2) drawdown and recovery of groundwater levels resulting from 8 years of ISR mining of the trona.

Barr Engineering conducted numerical groundwater modeling (Appendices M and N) using modeling code MODFLOW6 (Langevin et al. 2017) to simulate the groundwater system response to estimated groundwater pumping, ISR mining, and recovery. Modeling was performed using a larger regional Parent model, refined Child model, and a further refined Grandchild model. MODFLOW6 includes the capability to link the Grandchild model to the Child model and the Child model to the Parent model. The groundwater model domain for each model is shown on Figure 3.5-4 in Appendix Q.

The Parent model was constructed from a USGS model of the region (Martin 1996) with layering as listed in Table 3.5-4. Model cell size ranges from 20,000 × 25,000 feet on the periphery of the model to 3,125 × 3,750 feet throughout the Project area and at Flaming Gorge Reservoir. The Child model grid covers the Project area and has a uniform grid with cell size of 312.5 × 312.5 feet. The layering of the Child model is listed in Table 3.5-4. The Grandchild model was developed within the Child model domain to simulate the caverns and subsidence effects (Barr Engineering 2021c). The Grandchild model has a cell size of 276.8 × 276.8 feet around its boundary with the Child model, with an additional refinement of 34.6 × 34.6 feet in the region of the model that contains the mine caverns. Layering within the Grandchild model is listed in Table 3.5-5.

The Parent model inherited its boundary conditions from the USGS model. The Green River, Big Sandy River, Blacks Fork, Smiths Fork, and Hams Fork were represented using the river package within MODFLOW. Recharge distributions within the Parent and Child models were first sampled from the USGS model and refined during model calibration.

Table 3.5-5. Model Layering for the Parent, Child, and Grandchild Models

Grandchild Model Layer Number	Hydrostratigraphic Unit Represented	Approximate Average Thickness (feet)	Child Model Layer to which Grandchild Model Layer is Linked	Parent Model Layer to which Child Model Layer is Linked	Layer in USGS Model
1	Upper Bridger, Alluvium (where present)	80	1	1	1
2	Middle Bridger	10	2		
3	Lower Bridger	410	3	2	1
4	Upper Laney	100	4	3	2
5	Middle and Lower Laney	720	5	4	2
6	Upper Wilkins Peak	180	6	5	Quasi-3D confining bed
7	Upper Wilkins Peak	180			
8	Middle Wilkins Peak	240	7	6	3
9	Middle Wilkins Peak	120			
10	Middle Wilkins Peak	120			
11	Lower Wilkins Peak (mined trona beds)	70	8		
12	Tipton	50	9	7	Quasi-3D confining bed
13	Tipton	50			
14	Upper Wasatch	120	10	8	4
15	Upper Wasatch	480			
16	Middle and Lower Wasatch	2,980	11	9	5

Model calibration incorporated a steady-state water level dataset of 19 water levels from the Project area and 2,499 throughout the model area, estimates of stream-aquifer leakage, and drawdown and flows from a pumping test within the Wasatch aquifer. Both manual calibration methods and automated calibration software were used in the calibration. A detailed explanation of the conceptual hydrogeologic model, modeling approach and setup, steady-state and transient calibration, and model predictions are presented in the groundwater model technical reports (Barr Engineering 2021a, 2021b, 2021c, 2023).

Alternatives B, C, and D would have the same hydraulic stresses to the groundwater system and 8 years of ISR mining; therefore, there are no differences between action alternatives with respect to groundwater impacts.

Under the action alternatives, when compared to pre-mining or the No Action Alternative, the area of concern regarding potential impacts to water resources is the area that is predicted to experience an incremental reduction (drawdown) or increase (mounding) in groundwater elevation of 10 feet or more as a result of groundwater supply pumping and ISR activities. This approach is consistent with current industry standards and analogous to approaches taken in evaluating impacts at other mines: Bald Mountain Mine, the Cortez Gold Mines Deep South Expansion Project, and the Robinson Mine Plan of Operations Amendment. Changes in groundwater levels of less than 10 feet are typically difficult to distinguish from natural seasonal and annual fluctuations in groundwater levels.

3.5.2.2 *Alternative A (No Action)*

Under the No Action Alternative, no additional expansion onto BLM- or USFS-administered lands would occur. No ground disturbance would occur, and there would be no changes or alterations to the landscape; therefore, there would be no impacts to water resources. Existing conditions and trends in the analysis area would continue.

3.5.2.3 *Alternatives B (Proposed Action), C, and D (Preferred Alternative)*

Because the hydraulic stresses to the hydrogeologic system do not change between Alternatives B, C, and D, the alternatives are analyzed together.

To evaluate impacts, the numerical groundwater flow model was used to simulate the following time periods:

- An initial steady-state period representative of pre-mining conditions with no pumping, cavern development, or modifications to hydraulic conductivity distribution from cavern development.
- A 2-year period with five pumping wells within the Wasatch Formation, modifications to the hydraulic conductivity distribution surrounding the caverns (due to cavern development and subsidence), and constant head cells within the caverns assigned specified heads to represent pressure head within the caverns. Pacific Soda initially planned this water supply pumping from the Wasatch during construction of the water line from the Green River. Currently, Pacific Soda is not planning to pump from the Wasatch, and all water supply would come from the Green River. The Wasatch pumping was included in the modeling to be conservative with estimates of impacts from the pumping, should Pacific Soda decide to pull water from the Wasatch.
- An 8-year period, representing the final 6 years of ISR mining and an additional 2 years for the head (assigned specified heads), to build up to the maximum potential closure head.
- A 500-year period, representing long-term post-mining conditions. In this period, no specified heads were used to represent the head within the caverns; rather, the head within the caverns was allowed to equilibrate within the model.

Figure 3.5-5 (Appendix Q) shows the simulated maximum extent of the 10-foot drawdown contour within the Laney aquifer. Drawdown within the Laney aquifer is from aquifer hydraulic conductivity changes induced by subsidence (Barr Engineering 2021, 2023). The simulated head reduction in the Laney aquifer is due to physical changes in aquifer properties (change in stress and fracturing) rather than transient activities, such as pumping or solution mining. Within the simulation, head changes in the Laney aquifer begin shortly after mining begins, and the maximum extent of drawdown is reached within 50 to 150 years (Barr Engineering 2023). The maximum extent of the 10-foot drawdown within the Laney aquifer extends approximately 6 miles to the east, 10 miles to the south, 9 miles to the west, and 7 miles to the north. The maximum 10-foot drawdown contour does not extend to the Green River (Appendix Q, Figures 3.5-5 and 3.5-6).

The potential impacts of a reduction in groundwater head in the Laney and Wasatch aquifers resulting from Project well pumping or aquifer changes due to subsidence were evaluated at water rights points of diversions, which are on file with the Wyoming State Engineer's Office. Water rights that fell inside the maximum extent of the 10-foot reduction in groundwater head area (Appendix Q, Figure 3.5-5) in each aquifer were evaluated. No evaluation of water rights was performed within the Bridger Formation, because at no point did drawdown exceed 10 feet within the Bridger Formation. No water rights with wells in the Laney aquifer in the area bounded by the 10-foot drawdown contour were identified in the Wyoming State Engineer's Office database. One water right associated with a well within the Wasatch

Formation was identified: P419.W (Appendix Q, Figure 3.5-5). Simulated water levels declined to a maximum of approximately 170 feet half a year after pumping ended (Appendix Q, Figure 3.5-7). Water levels recovered to within 10 feet of pre-pumping water levels within 8 years after pumping ceased; however, these impacts were due to the initial 2 years of simulated water supply pumping, which Pacific Soda currently does not plan to do. Without the initial pumping from the Wasatch, these impacts are expected to be negligible.

Particle tracking within the model was used to simulate cavern fluid migration during recovery from the mine caverns. The particle tracking indicated that in recovery, particles migrated vertically upward through 35% of the Wilkins Peak and downward through 5% of the Tipton Shale. These penetration rates were achieved after approximately 150 years of recovery. The simulation continued for an additional 350 years with no further vertical migration into the Wilkins Peak or the Tipton Shale, indicating that the overlying Laney aquifer and the underlying Wasatch aquifer would not be impacted by cavern water. The low penetration rates from the caverns are due to the low hydraulic conductivities of the Wilkins Peak and the Tipton Shale.

As stated above, the potential impacts to groundwater quality would come from cavern fluid migration. These simulations show that constituents from solution mining would not migrate upward through the Wilkins Peak or downward through the Tipton Shale Formation. As a result, these constituents would not impact the overlying Laney aquifer or underlying Wasatch aquifer. Based on these findings, there would be no potential for water quality impacts to the Wasatch or Laney aquifers.

Simulated reduction in groundwater discharge to surface waters is listed in Table 3.5-6. Simulated decreases are extremely small. Simulated impacts to the Green River reaches would all be less than 0.1%, making them practically imperceptible. Simulated reductions to Blacks Fork, Smiths Fork, and Hams Fork would all be less than 2%. The largest impact to surface waters would be the diversion of 20 cfs from the Green River for Project water supply, which would represent approximately 1.5% of baseflow. This Project diversion of approximately 1.5% of baseflow from the Green River may increase if climate change further reduces the Green River flows.

Water quality impacts to surface waters would potentially be from stormwater runoff from disturbed areas within the Project area. Potential impacts could include increased sedimentation and elevated concentrations of constituents derived from the stormwater runoff. As part of the Project, a storm water management plan would be developed and implemented to reduce potential impacts to surface waters.

Table 3.5-6. Simulated Decreases to Surface Waters

River Reach	Baseline Simulated Groundwater Discharge into Reach (cfs)	Maximum Simulated Decrease in Groundwater Discharge into Reach (cfs)	Maximum Simulated Percentage Decrease in Groundwater Discharge into Reach (%)
Green and New Fork Rivers upstream from Fontenelle Reservoir	95	0.01	0.01%
Green River between Fontenelle Reservoir and the City of Green River, Wyoming	28.1	0.02	0.06%
Green River downstream from the City of Green River, Wyoming including the Flaming Gorge Reservoir	20.5	0.15	0.72%
Blacks Fork, Smiths Fork, and Hams Fork	3.7	0.06	1.53%
Big Sandy River	21.2	0.01	0.04%

3.5.2.4 *Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity*

All impacts described above for all alternatives would be irreversible. The subsidence-induced changes to hydraulic conductivity would be irreversible in the rock mass surrounding the mine caverns and the caverns themselves. These hydraulic conductivity changes would result in a lowering of the hydraulic heads within the Laney aquifer after recovery, which would also be an irreversible impact. Pumping for water supply from the Wasatch aquifer would result in a lowering of the water levels that extend some distance from the Project area. However, once pumping ceases, water levels would recover to within 10 feet of pre-pumping water levels within several decades, making this impact irretrievable.

As a result of mining operations, discharge to surface waters would be diminished. However, this decrease in discharge would be relatively small in comparison to total estimated discharge to surface waters. During mining, diversion from the Green River for water supply would reduce flow in the river by a small amount (less than 1.5%).

Water quality would not be impacted by subsidence in the Laney aquifer.

3.5.2.5 *Cumulative Impacts*

Two nearby trona projects have been identified as RFFAs: Project West and American Soda Solution Mining Expansion. Project West is adjacent to and northeast of the Project, whereas the American Soda Solution Mining Expansion is adjacent and west of the Project. Limited information is known about these projects other than general location, timing, and that they are solution-based trona projects. Both projects are scheduled to start in 2025.

For the cumulative impacts assessment to water resources, it is assumed that both projects would be similar to this Project with a life of mine of 8 years. The first 2 years of mine life would include groundwater production from the Wasatch aquifer, followed by water supply from the Green River, and ISR mining of the trona beds at the base of the Wilkins Peak. Each of the projects are also assumed to have a 20 cfs diversion from the Green River throughout the life of mine.

To estimate the cumulative impacts, the principle of superposition was used to predict the impact from the diversions from the Green River and the extent of drawdown within the Wasatch and Laney aquifers. The total diversion of 60 cfs from the Green River—20 cfs from each of the three projects—represents an approximate 4.2% of the annual average flow of Green River at the City of Green River (approximately 6.3% of the estimated baseflow).

Due to the proximity of all three projects, the maximum extent of the 10-foot isopleth within the Laney aquifer was estimated as a uniform expansion in all directions of 7 miles from the Pacific Soda only isopleth, which essentially tripled the area within the isopleth (Appendix Q, Figure 3.5-8). The uniform expansion of the isopleth represents a conservative estimate that is approximately twice what the expansion would be using a simple Thies analysis with triple the total pumping of 6,000 gpm compared to 2,000 gpm.

Because Pacific Soda currently does not plan to pump water from the Wasatch aquifer, the 10-foot drawdown isopleth in the Wasatch aquifer presented on Figure 3.5-8 (Appendix Q) represents drawdown due to 2 years of pumping from the Wasatch aquifer from both Project West and the American Soda Solution Mining Expansion. The Wasatch aquifer 10-foot maximum extent isopleth shown on Figure 3.5-8 (Appendix Q) has an area equal to twice that, which corresponds to the isopleth estimated for the case where Pacific Soda would pump water from the Wasatch aquifer for 2 years (Appendix Q, Figure 3.5-5). The uniform expansion within the Wasatch aquifer is a conservative estimate of approximately twice the

expansion and is similar to the uniform expansion estimated for the Laney aquifer. This is estimated from a simple Theis analysis with triple the total pumping of 6,000 gpm compared to 2,000 gpm.

Shallow groundwater drawdown greater than 10 feet is not expected as a result of the Project because the ISR extends well below shallow groundwater and is separated by confining units and aquifers. No shallow groundwater drawdown greater than 10 feet is expected from Project West or American Soda Solution Mining Expansion. With no groundwater drawdown greater than 10 feet expected in the shallow system of the Bridger Formation, no impacts to any seeps or springs within the area are expected.

Assuming estimates of impacts to stream flows from the Project are also representative of Project West and American Soda Solution Mining Expansion impacts, the cumulative impacts of all three projects will be tripled compared to what is presented in Table 3.3-6.

3.6 Geology and Mineral Resources

The Greater Green River Basin totals 24,613 square miles and is located within southwest Wyoming, northwest Colorado, and northeast Utah. The Wyoming portion of the Greater Green River Basin (Basin), the Green River Basin (GRB), comprises 14,700 square miles and is bounded by the Wyoming Thrust Belt to the west, the Rawlins Uplift and Sierra Madre Range to the east, the Wind River Mountains and Sweetwater Arch (Granite Mountains) to the north, and the Uinta Mountains to the south (Barr Engineering 2022). The analysis area comprises the Project area within the southeastern portion of the GRB, southwest of the Rock Springs Uplift that borders the Greater Green River Basin to the east (Appendix Q, Figure 3.6-1).

The topography of the GRB is generally characterized by nearly level terrain. However, an extensive portion comprises badlands, rims, and plateaus. Surface elevations range between approximately 6,000 and 9,500 feet amsl. The differential erosion of faulted and folded sedimentary and volcanic rocks strongly influences the topography and occurrences of minerals. The largest anticline—the north-south-trending Rock Springs Uplift—occupies the eastern margin of the Basin and affects feasibility of extracting mineral resources (Barr Engineering 2022). Lacustrine sediments of the Eocene epoch Green River Formation were deposited in the large Lake Gosiute that occupied several lacustrine sedimentary structural basins in southwestern Wyoming (Barr Engineering 2022). The location of the ancient lake with respect to the Basin and the analysis area is shown on Figure 3.6-1 (Appendix Q).

3.6.1 Affected Environment

Figures 4-1 and 4-2 in the Mine Plan (Appendix C) present a conceptual north-south cross-section through the GRB and the associated sedimentary rocks. In ascending order, the Wasatch, Green River, and Bridger Formations are the predominant geological units exposed throughout the Basin (Barr Engineering 2022). Former Lake Gosiute and its related formations are in the southeastern portion of the KFO, southwest of Granger, and are the source of the trona that would be mined.

Except for tuffaceous sediments, the drainage basins of the Eocene Lake Gosiute were the source of most of the Green River sediments, including the trona that would be mined under the Proposed Action. Volcanic tuffs were deposited directly into the lake, and tuffaceous sediments were washed into the lake from the surrounding drainage basins. Tuffaceous debris amounts to roughly 5% of the total sediments in the formation and readily decomposed in the alkaline lake waters. The alkaline lake waters probably supplied some of the dissolved sodium and other cations that compose some of the authigenic carbonate minerals found in the formation (Barr Engineering 2022).

Wasatch Formation. The Tertiary-aged Wasatch Formation is the first stratigraphic unit deposited within the GRB sequence considered here. Wasatch strata comprise red and gray shale and siltstone and massive, irregularly bedded fine-to-medium gray-to-brown sandstone that contains a few thin lenticular conglomerates. The sandstones are predominantly quartz but contain some feldspar and other minerals. Wasatch strata are irregular, facies-based, and discontinuous, but some zones of sandstone or shale within the formation can be traced for several miles. The Wasatch Formation was deposited on flood plains and in streambeds and deltas near Lake Uinta. The Wasatch thickness generally ranges from 3,500 to 4,500 feet (Barr Engineering 2022).

Green River Formation. The Green River Formation was mainly deposited by a widespread shallow Eocene inland lake known as Lake Gosiute. Volcanic tuff was washed into the lake from surrounding drainage basins and deposited in the lake sediments. These tuffaceous sediments account for approximately 5% of the total sediment in the formation; they readily decomposed in the alkaline lake waters and likely provided some of the dissolved sodium and other cations that comprise some carbonate minerals found in the Green River Formation (Barr Engineering 2022).

Lake Gosiute underwent three major phases of development, each corresponding to a member of the Green River Formation. In ascending order, these are the Tipton Shale, Wilkins Peak (host rock for the mined beds for this Project), and Laney Shale Members. The Wilkins Peak Member is described further below.

The Wilkins Peak Member, which is the trona host rock, consists of thin persistent stratigraphic beds of oil shale, marlstone, claystone, trona or trona-halite, limestone, and tuff with a maximum thickness of 1,300 feet in the southeastern portion of the GRB. The Mine Plan references as many as 42 nearly flat-lying trona beds in this member and numbered the thickest and economically most important of these beds from 1 to 25 in ascending order. Trona Bed 1 is the lowest and lies immediately above the Tipton. Pacific Soda selected Trona Beds 1 through 4 to grow a cavern from bottom to top for this Project. These beds were chosen for their high ore grade and low halite content of less than 2% (Barr Engineering 2022). Halite concentrations increase to percentages above 2% in Trona Bed 5, making the overlying beds not economical to process the trona and remove the halite from the product.

Bridger Formation. The Bridger Formation is the youngest unit exposed at the surface and consists of gray and green sandstone and mudstones. Thin beds of conglomerate, limestone, shale, siltstone, tuff, and rare thin beds of carbonaceous shale, carbonaceous siltstone, and oil shale are interbedded with the sandstone and mudstone. These units are of fluvial origin and contain large amounts of reworked and disseminated volcanic ash. The maximum recorded thickness of the Bridger Formation is approximately 2,000 feet (Barr Engineering 2022).

3.6.1.1 *Structural Geology in Project Area*

The trona beds are nearly flat (dips are commonly approximately 1 degree or less). No active fault systems have been identified and mapped within or near the Project area. The closest mapped fault system is named the Hogsback Fault, and it is associated with the Bear River Fault Zone, approximately 57 miles southwest of the City of Green River and near the town of Fort Bridger in Uinta County. The Chicken Springs Fault system is approximately 90 miles northeast of the city of Rock Springs (Barr Engineering 2022). Review of information does not suggest the presence of structure within the Project area that would impact the trona resource or solution mining of the resource.

3.6.1.2 Seismicity

Tectonically, the GRB has not been seismically active over the last century. A total of 30 magnitude 2.0 and greater earthquakes have been recorded in Sweetwater County from as early as 1888 and as recently as 2001. Most historical earthquakes are associated with buried fault systems, and many modern events are associated with mining activities. The Chicken Springs fault system in northeastern Sweetwater County, approximately 90 miles northeast of Rock Springs, comprises east-west trending fault segments. The most recent activation of the system appears to be Holocene in age. Exploratory studies have indicated that the fault system could generate a magnitude 6.5 earthquake. Such an event would be similar to a Modified Mercalli Scale Intensity V earthquake capable of causing light damage. Over the past 140 years, only four to six earthquakes of magnitude 2.0 or greater (equivalent to an intensity of III) have been recorded within the approximate Project area (Barr Engineering 2022: Section 7.4.2.1).

Roof falls, pillar failures, and collapses in underground mines have been associated with several earthquakes. The largest event occurred on February 3, 1995, when a magnitude 5.3 earthquake occurred after the collapse within the Solvay Minerals, Inc., underground trona workings. Degradation of one or more pillars and the collapse of the roof may have caused this earthquake. However, poor documentation and poor location accuracy have created uncertainty regarding the seismic origins of some earthquakes; as such, it is not known with certainty that they are linked to mining activities.

The USGS publishes probabilistic acceleration maps for 500-, 1,000-, and 2,500-year time frames. Based on the 500-year map (10% probability of exceedance in 50 years), the estimated earthquake intensity in Sweetwater County is a magnitude V event that would result in cracked plaster and broken dishes. The 1,000-year map predicts an intensity V to VI earthquake, which could result in fallen plaster and damaged chimneys. The 2,500-year map estimates intensity VI and VII earthquakes, which are capable of causing slight-to-moderate damage in well-built structures and considerable damage to poorly built structures. The peak ground acceleration associated with a 2% probability of exceedance in 50 years was 0.2 gram (i.e., 20% of the acceleration of gravity) for the GRB. Pre-mining, the GRB and the mine permit boundary lie within Seismic Zones 1 and 2 of the 1997 edition of the uniform building code, which are generally considered a low seismic risk area (Barr Engineering 2022: Section 7.4.2.1). A seismic zone map and a map showing the 2% probability of exceedance in 50 years of the peak ground acceleration are also provided in the Mine Plan as Figures 7-1 and 7-2.

3.6.1.3 Mineral Resources in Affected Environment

Mineral resources in the GRB include the individual resources of locatable, leasable (oil and gas, coal, sodium [trona], phosphate, oil shale), and salable minerals. More information regarding the various mineral commodities is available in the BLM Mineral Assessment Report (BLM 2004a) and can be accessed on the Kemmerer RMP revision website (<https://eplanning.blm.gov/eplanning-ui/project/63198/570>).

Fluid Leasable Minerals

An evaluation regarding safety issues associated with oil and gas drilling within or near active trona mining areas resulted in suspension of existing oil and gas leases in the Mechanically Mineable Trona Area since 1995. No new oil and gas leases would be issued in the Mechanically Mineable Trona Area until safety issues are resolved. The Mechanically Mineable Trona Area is an area generally defined by active trona mining, as well as various geological factors, including trona bed thickness, depth below the surface, and purity (BLM 2010a). Due to the suspension on oil and gas leasing, impacts to this resource are not discussed further here and are not carried forward for analysis.

Other fluid leasable minerals in the Kemmerer RMP planning area include carbon dioxide, helium, and geothermal resources. These leasable minerals have low potential for development over the planning period, are not discussed further, and have been dismissed from analysis.

Locatable Minerals

Locatable minerals that occur in various geological formations in the planning area include metals (e.g., gold, silver, titanium, copper, chromium, and uranium) and commodities, such as fire clay and bentonite. Precious gems known to occur or that have the potential to occur within the planning area include diamond, pyrope garnet, and chromium diopside. Mining claims have been staked for various commodities, including building and specialty stone in the planning area. Unlike leasable minerals (e.g., oil, gas, or coal) or salable minerals (e.g., sand and gravel), where issuance of a lease or permit is at the BLM's discretion, the discovery and location of a locatable mining claim is a non-discretionary right (BLM 2008a). No claims are known to exist in the Project area. Additionally, the Project area is withdrawn from locatable mineral entry. Therefore, locatable minerals were not carried forward for analysis as a potential affected resource.

Saleable Minerals

Saleable minerals, also known as mineral materials, include common varieties of materials, such as sand, gravel, shale, boulders, moss rock, stone, gravel, pumice, pumicite, cinders, and clay. These are obtained through use permits or commercial sale for volumes above 200,000 cubic yards or if there are competing interests. In addition, the WYDOT uses Material Site ROWs to obtain saleable minerals from the BLM for road construction that involves federal funds. In general, saleable minerals are obtained through surface mining. With the exception of surface disturbance conflicts and ROWs, the Proposed Action would not impact development of saleable minerals in the area. Saleable minerals were not carried forward in analysis.

Leasable – Coal

Wyoming has the largest Federal coal program in the BLM and is the nation's largest producer of coal, with approximately 34% of the nation's coal production. Outcrops of coal-bearing formations in the planning area occur mainly in three north-south-trending belts, which are located outside the Project area. Although coal is present in the GRB, primary mining has not occurred proximate to the Project area and is within counties east and north of Sweetwater County, where the Project area is located, and in association with a structure that has resulted in the uplifting of the beds (BLM 2008a). The coal within the Project area is not at a depth that is economically viable to mine; therefore, coal was not carried forward in the impacts analysis.

Leasable – Sodium (trona)

The world's largest known trona deposit is located in southwestern Wyoming and extends into the eastern portion of the planning area (BLM 2004a). All trona in the planning area is mined underground. Trona is a hydrous sodium carbonate mineral refined into soda ash, sodium bicarbonate, sodium sulfite, sodium tripolyphosphate, and chemical caustic soda (Wyoming State Geological Survey [WSGS] 2002). Soda ash is the trade name for sodium carbonate, a chemical obtained from trona and sodium-carbonate-bearing brines (USGS 2003). Soda ash is used in a variety of applications: glass production accounts for 48% of the domestic use; the chemical industry accounts for 26%; soap and detergents, 14%; and other users, such as the pulp and paper, water treatment industries, and the manufacture of baking soda, make up the remaining 12% (WSGS 2002). Soda ash can be synthetically manufactured from salt and

limestone, both of which are practically inexhaustible; however, synthetic soda ash is more costly to produce and generates environmentally harmful wastes (USGS 2003).

Trona resources found on federal lands are considered leasable minerals. The area where trona is known to exceed 4 feet in thickness is part of the KSLA, which covers approximately 1,100 square miles, half of which is in the eastern portion of the KFO (Volume 2, Map 13 of the Proposed Plan and Final EIS for the BLM Kemmerer Field Office).

All public lands within the KSLA currently not leased are available for leasing consideration. Sodium leases are subject to renewal every 10 years after the initial 20-year term. Prospecting permits outside the KSLA are considered and modified when necessary to ensure consistency with the objectives of protecting other resources. Prospecting permits may be denied if it is determined that exploration or development impacts are inconsistent with other resource management objectives. In addition to prospecting permits for sodium, exploration licenses may be issued within the KSLA for sodium lands that are not currently leased.

The trona is found in the Wilkins Peak Member of the Green River Formation, which includes at least 42 trona beds that are 400 to 3,500 feet below the surface—the majority of which are considered of insufficient quality to be mineable. In the trona deposition area, which extends outside the KFO, there are approximately 36 billion tons of halite-free trona and 25 billion tons of mixed trona and halite that occur in beds more than 1.8 m thick (USGS 2007). Ninety percent of the nation's trona production and 30% of the world's soda ash production comes from southwestern Wyoming, with four of the five underground mines in the KFO. Trona mining began in southwestern Wyoming in 1947. Wyoming production of trona in 2005 totaled more than 13 million short tons. Approximately 1.8 tons of trona are required to produce 1 ton of soda ash. Approximately 35% of Wyoming soda ash production is exported to other countries. According to the American Natural Soda Ash Corporation, approximately 4.41 million short tons of soda ash were exported from Wyoming in 2000 (WSGS 2002).

Within the Project area, other mining operations have produced trona from underground mines in past operations. The FMC Granger Mine was flooded with water and saturated solution was pumped to the Granger Soda Ash Plant for recovery. Solution mining represents only a small fraction of total production. Most trona production uses conventional room-and-pillar and longwall mining. The FMC Westvaco and General Chemical mines had separate facilities for underground solution mining of trona (drawing water with dissolved trona from the underground workings), both of which are shut down. Three trona lessors (federal, state, and private) have issued leases within the KSLA in the Granger/Little America area. Table 3.6-1 shows trona production by mine in 2005. Production rates in 2022 and current operations are discussed below. Some intermittent production of salt brine has occurred for use as a binder on roads.

Table 3.6-1. Trona Production by Mine, 2005

Mine Name	County	Facilities Operated	Production (estimated tons)
Granger Mine/FMC Wyoming Corporation	Sweetwater	Underground mine processing	130,000
Westvaco Mine/FMC Wyoming Corporation	Sweetwater	Underground mine processing	4.7 million
Alchem Mine/General Chemical Corporation	Sweetwater	Underground mine processing	4.7 million
Solvay Trona Mine/Solvay Chemicals, Inc.	Sweetwater	Underground mine processing	4.0 million
Total production			13.53 million

Source: BLM (2008).

Current trona mines in Wyoming include Genesis Alkalai, Sisecam Wyoming, and Tata Chemicals for a combined 2022 total trona production of 18,482,320 tons (State Mine Inspector 2022). Challenges for trona mining involve surface tailings disposal, air quality, and multiple mineral development conflicts, primarily with oil and gas. However, as specified in the Kemmerer RMP, oil and gas leases have been suspended; therefore, impacts to these leases were dismissed from further consideration.

As discussed earlier in this section, the lower trona beds in the Green River Formation are targeted for mining, as specified in the Mine Plan. Other trona mining could occur in the Project area; however, due to impurities in other upper beds, discussed earlier, this mining is not likely. Therefore, impacts to other trona mining in beds located above the beds that are targeted by the Proposed Action are not expected as part of the affected environment and have been dismissed from further analysis except to note that these beds may be displaced as a result of dissolution and collapse/subsidence.

Halite. In addition to numerous sodium leases for trona, there is a sodium lease for halite (sodium chloride) in the planning area, approximately 50 miles northwest of Kemmerer on a small salt spring in the Bridger-Teton National Forest. This limited halite resource area is not near the Project area and was therefore not considered further.

Carbonates and Breccias. After deposition and lithification of the Green River Formation sediments and their associated sodium carbonate deposits, groundwater dissolved some of these sodium minerals, as evidenced by the presence of solution breccias and solution cavities in drill cores recovered from exploratory wells drilled into the formation. This indicates that natural dissolution and collapse is possible in evaporate deposits without mining. The drill cores for the Project did not show any breccia structure. Therefore, breccias were not carried forward for further analysis.

Trona Resource Estimate Calculation

Within the Project area, all four drillholes encountered the 17 trona beds with thickness varying from 2.5 to 28.1 feet. Pacific Soda used only Trona Beds 1 through 4 for the resource calculation because of their high ore grade and low halite content (less than 2%). The criteria for selection included grade of trona (70%–90%), percentage of halite (less than 1%), magnesium (less than 1%) and iron (less than 1%). The mineral resource was estimated based on coreholes, lithologic and gamma logging, mineral resource assays, and modeling to estimate bed continuity. The beds were modeled for determining lateral continuity. For this Project, the trona resource has been estimated by Pacific Soda (Table 3.6-2) and is provided in the Mine Plan (Appendix C, Table 4.4 and Figures 4-7–4-9). The criteria used to select Trona Beds 1 through 4 for mining were the high grade trona (70%–90%) and percent halite, magnesium, and iron. Beds were identified that were high grade trona (70%–90%), less than 2% halite with low percentages of iron and magnesium (see Section 4.2.1.1 in the Mine Plan), and range in thickness from 6.7 feet to up to 28.1 feet with interbeds between the layers (see Section 4.3 in the Mine Plan). Modeled bed continuity was integrated into the resource estimate (see Table 4-2 in the Mine Plan). The estimated resource in Table 3.6-2 includes portions of Trona Beds 1 through 4, which laterally extend beyond the mine permit boundary. The resource estimate includes use of assay and logging information for corehole 31-1 and a polygon from the model. This corehole and the polygon used to determine bed lateral continuity is outside the current mine permit boundary. As a result, only a portion of the resource in Table 3.6-2 would be mined as part of the Proposed Action and alternatives.

Table 3.6-2. Estimated Trona Resource Available in Mine Area

Bed Number	Hole Number	Volume (cubic feet)*	Density (pounds/cubic feet)	Trona (%)	Trona (million tons)
1	25	1,854,242,150	136.1	84.6%	106.74
1	27	1,164,063,613	138.0	82.2%	66.01
1	31	7,344,884,143	136.1	87.0%	434.82
1	35	729,937,904	136.1	90.0%	44.70
2	25	1,093,198,198	136.1	85.5%	63.60
2	27	938,537,304	138.0	80.1%	51.86
2	31	5,385,962,599	136.1	85.4%	312.99
2	35	521,298,595	136.1	84.4%	29.94
3	25	535,717,477	136.1	88.9%	32.41
3	27	398,513,123	138.0	84.4%	23.12
3	31	2,461,314,692	136.1	87.1%	145.88
3	35	242,503,256	136.1	45.2%	7.46
4	25	702,209,264	136.7	88.5%	42.48
4	27	567,093,333	136.7	90.2%	34.97
4	31	2,409,626,785	136.7	77.7%	127.83
4	35	311,070,463	136.7	84.7%	18.01
Total					1,542.8

Source: Barr Engineering (2022).

* Measured + Indicated + Inferred Resources.

Leasable – Other Solid Leasable

Other than coal and trona, solid leasable minerals in the KFO include oil shale and phosphate. Access to BLM-administered leasable minerals is at the BLM’s discretion. Furthermore, due to the structural geology, as well as current technology and economic conditions, the oil shale is not mineable. Therefore, impacts relating to this mineral resource were not carried forward in the analysis.

3.6.2 Environmental Consequences

3.6.2.1 Analysis Method

Metrics for geological impacts include the area that may experience subsidence, which would result in displacement at the ground surface and create geological hazards to structures on the surface, such as pipelines, buildings, and impoundments. Under all alternatives, mining associated with this Project would remove trona in the lowermost beds 1 through 4 at a depth of 2,300 feet bgs using solution mining (injection and extraction) techniques. This would open 278 caverns that may collapse and result in displacement of overlying trona beds and geological formations above the trona beds (Barr Engineering 2022). The impacted area for subsidence would be the area overlaying the trona beds, which is expected to be approximately 2,963 acres (Barr Engineering 2022). This predicted area of effect would occur in Sections 23–26 and 35 (Barr Engineering 2022) within the mine permit boundary with maximum subsidence predicted to occur at the center of the solution caverns in the mined area. This area may also experience increased seismicity during cavern collapse.

In terms of subsidence impacts to the proposed pipelines, the subsidence model results indicate that there would be a maximum subsidence of 6.0 feet at the ground surface (Appendix C). However, the predicted ultimate strain (1.8 millistrain) is less than the damage threshold of 2.3 millistrain for buried pipelines. However, within strain thresholds, subsidence monitoring and inspections would be performed to verify that pipeline integrity is maintained (Barr Engineering 2022). Accordingly, the potential subsidence impact to buried pipelines was not carried forward for further analysis.

Ground slopes and strains at the edges of the subsidence trough can cause damage to tall surface structures and natural surface features. However, there are no existing or proposed tall structures planned in the subsidence influence zone; therefore, this potential subsidence impact to structures was not carried forward for further analysis.

Pacific Soda reports that it is not currently possible to estimate site-specific subsidence impacts to the proposed rail line and access road, but that they would design these to account for potential subsidence impacts. Accordingly, this potential subsidence impact to the rail line and access road was not carried forward for further analysis. The Applicant proposes a monitoring plan to, at a minimum, check for track deformities, grade changes, horizontal displacements, and tensional or compressional failures of specific components (Appendix C). The Applicant also proposes mitigation to address impacts to the rail line and access road from subsidence with remedial measures to include site-specific re-ballasting and realignment of track, replacement of damaged rail components, site-specific stabilization of adjacent grounds, and site-specific corrections to drainages.

The consequences of mining were analyzed by the Applicant using modeling techniques to assess potential indicators of impact and possible spatial impacts. Details can be found in Section 5.2.3.9 of the Mine Plan. Potential impact issues and environmental consequences identified for geology and minerals for this Project consist of the following:

- Geological hazards, including increased seismicity and ground deformation, may be created or exacerbated by development of the Proposed Action or alternatives using solution mining extraction techniques that result in collapse and secondary impacts that are associated with that collapse.
- Deformation may occur from subsidence related to solution mining cavern development and cavern interburden or overburden collapse that may propagate upward and be expressed at the ground surface. This process may result in the upward displacement of geological formations and members, subsidence cracking from differential settlement, and stress and strain on structure.

Environmental consequences and impacts were analyzed and predicted by Pacific Soda using two predictive modeling techniques for assessing subsidence. Numerical modeling of subsidence was performed using the FLAC3D (Barr Engineering 2022: Section 5.2.3.9) numerical model. An empirically derived model, Surface Deformation Prediction Software, predicts maximum possible subsidence and strain (Barr Engineering 2022). Modeling was used by Pacific Soda to assess both temporal and spatial elements of impact.

Predictive modeling was used for estimating the subsidence-related impacts and as the basis for developing BMPs and monitoring techniques for determining the impacts of Alternatives B, C, and D. Alternative A is the No Action Alternative; therefore, no assessment of environmental consequence was performed for that alternative.

Detailed information regarding analysis and impact indicators (such as ground surface elevation declines) for this impact can be found in the following documents (Barr Engineering 2022):

- Mine Plan, Section 5.2.3.9, Subsidence (with subsection on Subsidence Modeling)

- Mine Plan, Section 7.4, Geologic Hazards
- Mine Plan, Appendix P
- Mine Plan Appendices Q–T (Design Plans)—where appropriate designs have been modified to accommodate effects of subsidence of structures crossing the mined area
- Dry Creek Trona Project – Subsidence Modeling Technical Memorandum (Barr Engineering 2021).

Removal of Known Sodium Leasing Area Trona Resource from the Mined Area

The primary impact from the Project is the removal of trona from the mined area. These impacts were analyzed by estimating the total trona resource that is available in the Project area and by estimating the annual rates of extraction from solution mining over the life of mine. This is an expected impact and a positive result of successful mining of the trona resource as planned and allowed within the KSLA. Indicators of this impact are the quality and amount of trona mined through solution mining compared to resource-estimated and planned extraction rates.

3.6.2.2 *Alternative A (No Action)*

For the No Action Alternative, no additional expansion onto BLM- or USFS-administered lands would occur. Additionally, no ground disturbance would occur, and there would be no changes or alterations to the landscape; therefore, there would be no subsidence impacts or impacts to mineral resources from impact-causing Project elements. Existing conditions and trends in the analysis area would continue.

3.6.2.3 *Alternatives B (Proposed Action), C, and D (Preferred Alternative)*

For Alternatives B, C, and D, the area of potential impact is the mined area, which is the same size for all three alternatives.

Subsidence Impacts

The impacts of subsidence for the alternatives have been estimated using computer modeling. As stated in the previous section, mining associated with this Project would remove trona in the lowermost beds 1 through 4 via dissolution, which would create 278 caverns that are predicted to collapse and result in displacement of overlying trona beds and geological formations above the trona beds and the ground surface directly above the mined area.

Modeling indicates that as much as 6 feet of collapse could occur at the ground surface in conjunction with the dissolution mining. Maximum surface subsidence is predicted to be the sum of both elastic and plastic deformation due to cavern development, as well as time-dependent deformation due to creep. Subsidence due to elastic and plastic deformation of the pillars and caverns is predicted to be 0.56 feet after 8 years of mining. Average cavern creep rates are predicted to induce ground subsidence rates of 0.6 feet per year (Appendix C). The modeled rate of collapse is 0.28 feet per year after mining.

Upon well plugging at year 10, the total subsidence predicted by analysis via modeling is approximately 6.0 feet at the center of the mine well field trough (Barr Engineering 2021). This boundary roughly equates to the potential subsidence impact area. The area of maximum subsidence predicted by modeling is shown on Figure 8 of *Subsidence Potential of the Pacific and Atlantic Soda Project, Trona Solution Mining at Sections 23, 24, 25, 26 and 35* (Richland Mining Consulting 2021). As shown on that figure, modeled subsidence is contained within the mine permit boundaries (Richland Mining Consulting 2021).

Subsidence modeling indicates that subsidence would stop once cavern plugging is completed. The acreage of maximum predicted subsidence impact is summarized in Table 3.6-3.

Table 3.6-3. Maximum Predicted Subsidence Impact

Project Area	Acreage of Potential Impact
Processing facility and storage ponds (Sections 22, 27, and 28)	1,597
Section 23 mine well field	320
Section 24 mine well field	320
Section 25 mine well field	320
Section 26 mine well field	320
Section 35 mine well field	320
1/6th of Section 36 – buffer added to mined area	54
Total affected acreage	2,963

Pacific Soda has committed to mitigating effects of subsidence, if observed. Pacific Soda would initiate subsidence mitigation if mine-induced subsidence is deemed to impact the integrity of pipelines or other critical infrastructure. A site-specific subsidence mitigation plan would be developed, if necessary, discussed with any third-party infrastructure owners, and provided to the Wyoming DEQ LQD and BLM (Barr Engineering 2022).

Based on monitoring results, the level of measured and/or observed impact that would trigger mitigation would be defined for critical infrastructure upon completion of the final design, with the intent to initiate mitigation at acceptable strains, slope changes, and/or curvatures significantly below damage threshold levels. This plan would be updated to reflect mitigation triggers prior to production and/or measurable subsidence (Barr Engineering 2022).

The primary subsidence metrics that would be monitored during the Project and used to determine mitigation triggers consist of the following (Barr Engineering 2022):

- Monitoring for subsidence at designated GPS stations. GPS monument monitoring stations would be set up throughout the mined sections and along injection and extraction system corridors and adjacent to well pad sites to allow post-processed or real time kinetic surveys (Barr Engineering 2022: Section P.3.3.1). Surveys would be conducted twice per year until wells are plugged. Aerial survey methods, such as LIDAR, may also be used by Pacific Soda.
- Cavern Geophysics Monitoring—Gamma logging, digital magneto telluric.
- Material balance calculations to track amounts of trona removed in solution (Barr Engineering 2022: Section 5.2.3.4).
- Fluid loss monitoring (Barr Engineering 2022: Section 5.2.3.5) to ensure that fluid recovery is occurring, and dissolution is proceeding in a controlled manner.
- Installation of an extensometer borehole as part of the Subsidence Monitoring and Adaptive Management Plan (Barr Engineering 2022: Appendix P). An extensometer was drilled to 1,300 feet above the mining zone and 1,000 feet along the cavern centerline, including three anchors, to allow daily recordings and monthly downloads to track subsidence at depth and allow response actions at the surface.

- Targeted infrastructure monitoring would be performed using tilt meters or strain gauges for the natural gas and water pipelines to track strain and shift (Barr Engineering 2022).
- Storage pond embankments adjacent to the mined area (in Section 22) would be monitored using pairing stations to measure strain (Barr Engineering 2022). Other ponds would be inspected quarterly.

Impacts on Trona Resources

Under all action alternatives, during the mine life of the mine, 6.0 million tons of trona and 440,900 tons of sodium bicarbonate would be removed each year for total removal of roughly 150 million tons of trona and 11 million tons of sodium bicarbonate from total estimated pre-development trona mineral resources of 1,543 million tons in Beds 1 through 4, a portion of which is outside the mine permit boundary (Appendix C, Figure 4-9, see location of corehole 31-1).

3.6.2.4 *Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity*

The potential subsidence impacts described above would be irreversible for the 2,963 acres of the mined area. Additionally, the removal of 165 million tons of trona described above would also be irreversible but would not impact long-term sustainability of other trona resources or multiple use in the analysis area and is consistent with BLM management of the KSLA and adjacent areas as mandated in the Kemmerer RMP.

3.6.2.5 *Cumulative Impacts*

The proposed mined area is the same for Alternatives B, C, and D. For these alternatives, the solution mining method would consist of extracting the trona resource through dissolution of the deposits by injecting fluid and extracting fluid. The process of dissolution is halted through injection of brine and plugging.

The primary impacts to geology and mineral resources pertain to the creation of caverns by the mining process. The overburden above Trona Beds 1 through 4 and interbeds span the caverns as they grow and collapse into the caverns. This collapse into the open caverns would be propagated upward through overlying stratigraphy to the ground surface, and the collapse itself would result in increased seismicity in the area. The secondary impacts would be subsidence, which spoil or offset overlying trona beds and make them not viable to mine, and increased seismicity.

There are two proposed projects in the vicinity of the Project: American Soda Solution Mining Expansion and Project West. Details regarding these proposed projects are not known at this time. It is possible that there could be cumulative effects from solution mining performed directly adjacent to the Dry Creek mined area, which could result in increased seismicity or additional subsidence risks.

Beyond the impacts of the proposed Project as described above and these two additional projects, there would be no cumulative impacts related to subsidence. This is because there is currently no other solution mining at depth within the analysis area that would result in subsidence. The American Soda Solution Mining Expansion is more than 6 miles west-northwest of the mined area, and Project West is more than 10 miles north of the mined area. Although mining details for these projects are currently unknown, effects may be possible. These projects appear outside the predicted subsidence area for the Project, but it could be impacted by the other two projects if impacts from those projects are wider reaching.

3.7 Cultural Resources

Cultural resources, as broadly defined in BLM Manual 8100 (BLM 2004b), are locations of human activity, occupation, or use identifiable through field inventory (survey), historical documentation, or oral evidence. These activities represent human social interaction and/or interaction with the natural or built environment, are generally at least 50 years of age or older, and may or may not be considered significant and therefore eligible for the National Register of Historic Places (NRHP). Resources that are eligible for or listed in the NRHP are referred to as historic properties. In totality, the term *cultural resources* encompasses archaeological sites, historical buildings, structures, objects, and districts considered important to a culture, subculture, or community for scientific, traditional, religious, or other purposes, as well as specific areas of the landscape that are important to Native American Tribes or other culturally recognizable groups. They are recognized as fragile and irreplaceable material, places, and things with potential public and scientific uses.

The analysis area for impacts to cultural resources consists of the area of potential effect (APE), as defined by the BLM based on direct, indirect, and cumulative effects on federal, state, and private lands that may be affected by the mine well field, pipeline corridors, rail line, processing facilities, access roads, transmission lines, and other related infrastructure for the Project. Per the *Programmatic Agreement Among the Bureau of Land Management, Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers Regarding the Manner in which BLM will Meet its Responsibility Under the National Historic Preservation Act* (State Protocol) (BLM and Wyoming State Director and Wyoming SHPO 2014), the analysis area for direct impacts consists of the areas within which cultural resources may sustain physical alteration or destruction as a result of the Project and is defined as the acreage associated with 1) the footprint of the Proposed Action and alternatives for block Project elements and 2) twice the construction ROW (temporary and permanent) for linear Project elements. This analysis area was used to determine the potential to encounter unknown cultural resources within the Project area on the ground surface or subsurface. The analysis area for indirect impacts to cultural resources consists of the area in which visual, auditory, and atmospheric elements of the Project could diminish the integrity of historic properties for which setting, feeling, and/or association are aspects of such integrity and is defined as a 1-mile buffer around the Project footprint for each action alternative (Appendix Q, Figures 3.7-1, 3.7-2, and 3.7-3).

The analysis conducted and presented in this section is based on literature reviews that were completed for the Proposed Action (Alternative B) and each alternative (Alternative C and Alternative D) (Kautzman 2022, 2023) and on a supplemental review of data contained in WyoTrack, an online cultural resource database maintained by the Wyoming Cultural Records Office in coordination with the Wyoming SHPO. Incomplete information has been used to attempt to identify impacts of the Project on cultural resources. Following issuance of the Record of Decision, the BLM, in coordination with other federal agencies, SHPOs, and other consulting parties, would take steps to avoid, minimize, or mitigate impacts to historic properties in accordance with Section 106 of the NHPA through implementation of the Programmatic Agreement (Appendix G).

3.7.1 Affected Environment

The analysis considers how cultural resources, including historic trails and resources and places of Tribal significance, could be directly or indirectly impacted by the Project and quantifies the types and numbers of these resources present and projected within the analysis area.

To provide a thorough understanding of the cultural resources in the affected environment, literature reviews were completed for the Proposed Action (Alternative B) and each alternative (Alternative C and Alternative D) (Kautzman 2022, 2023). The literature reviews included an assessment of prior intensive

inventory acreage (i.e., survey coverage) within the Public Land Survey System (PLSS) sections containing each alternative plus a 500-foot-corridor centered on all linear Project infrastructure, as well as identification of previously recorded cultural resources within the same PLSS sections. In addition, the literature review identified cultural resources of significance for which setting and feeling are character-defining elements of the resource's eligibility within 1 mile of each action alternative. Resources were further broadly categorized by temporal affiliation (precontact, historical, or multicomponent) and eligibility for the NRHP.

A total of 415 previous cultural resource investigations have occurred within the PLSS sections containing the Proposed Action and alternatives between 1986 and 2019 (Kautzman 2022:32–33; Kautzman 2023:28). Approximately 81% (n = 338) of these investigations are Class III (intensive-level) surveys that covered 7.98% of the acreage in the PLSS sections, with the greatest survey coverage present in the PLSS sections associated with Alternative C. Other previous investigations include Class I literature reviews, Class II surveys, and projects classified as monitoring/open trench inspection, testing, trail studies, site evaluation/assessment projects, and data recovery projects (Kautzman 2022:32; Kautzman 2023:28). Table 3.7-1 provides a summary of Class III survey coverage at the PLSS level by action alternative.

Table 3.7-1. Summary of Class III Survey Coverage within Literature Review Area by Alternative

	Alternative B (Proposed Action)	Alternative C	Alternative D
PLSS acres by alternative	59,063	59,619	35,592
PLSS sections overlapping analysis area	97	98	76
Acres surveyed by PLSS	4,316	5,862	2,127
Number of Class III surveys	303	168	190
Class III survey area (percentage of coverage within analysis area)	7.31%	9.83%	5.98%

Class III investigations to date have recorded a total of 611 distinct cultural resources across the action alternatives within the PLSS sections associated with the Project and within 1 mile of the Project footprint (Kautzman 2022, 2023). Approximately 83.5% of the sites (n = 510) represent precontact use of the area, 13.6% of the sites (n = 83) represent historical use of the area, and 2.9% of the sites (n = 18) contain both precontact and historical components (Table 3.7-2). These cultural resources represent archaeological sites; historic architectural and engineering resources, including historic trails; and potential resources and places of Tribal significance (Section 3.7.1.2).

Table 3.7-2. Summary of Known Cultural Resources within Public Land Survey System Sections by Alternative

Resource	Alternative B (Proposed Action)	Alternative C	Alternative D
Precontact resources	380	255	196
Historical resources	51	29	42
Multicomponent (precontact and historical) resources	13	11	12
Total	444	295	250

Note: Count of historical resources includes the base trail and each individual segment recorded. Some resources occur in multiple alternatives.

Archaeological resources relate to the full scope of human presence in the vicinity of the Project, from the Paleoindian period to the Historic period. Most archaeological resources that have been able to be dated have been identified as being from the Early Archaic, Late Archaic, and Late Prehistoric periods (roughly the last 8,000 years) and are generally identified as lithic scatters or open camp sites. However, the majority of the archaeological sites are broadly identified as being associated with the Precontact period or the Historic period.

Historical archaeological sites and components, as well as historic architectural and engineering resources, found across the Project area represent habitation, transportation, farming and ranching, water control, and date from the Territorial era to the Modern era.

Native American resource types found within the Project vicinity generally are precontact and can contain features such as hearths, stone circles, alignments, cairns, burials, and rock art, as well as artifacts, such as chipped stone tools and debitage, ground stone, fire-altered rock, ceramics, and faunal and floral material.

For each action alternative, most of the known cultural resources (between 67% and 70.5%) are considered not eligible for the NRHP or non-contributing to the overall eligibility of a linear resource. A much smaller percentage (between 13.7% and 16.1%) is considered eligible for the NRHP or as contributing to the overall eligibility of a linear resource (Table 3.7-3). The remainder of the known cultural resources (10.3% to 15.9%) are unevaluated for eligibility for the NRHP or have an unevaluated contributing status to a larger linear resource.

Table 3.7-3. National Register of Historic Places Eligibility of Cultural Resources by Alternative

NRHP Eligibility	Alternative B (Proposed Action)	Alternative C	Alternative D
Listed NRHP	1	1	0
Eligible resources	65	50	34
Eligible linear resources, contributing	0	0	1
Eligible linear resources, non-contributing	11	9	7
Eligible linear resources, unevaluated contributing status	15	2	14
Not eligible resources	296	205	170
Unevaluated resources	56	28	24
Total resources	444	295	250

3.7.1.1 Historic Trails

National Historic Trails (NHTs) are “extended trails that closely follow a historic trail or route of travel of national significance” (BLM 2020). The National Trails System Act of 1968, as amended, states that such trails “shall have as their purpose the identification and protection of the historic route and its historic remnants and artifacts for public use and enjoyment” (NPS 2019). BLM Manual 6280 (BLM 2012b) identifies requirements of NEPA processes for proposed actions that could impact NHT and/or trails that are undergoing feasibility studies to become NHT.

The California NHT, Oregon NHT, and Mormon Pioneer NHT (which represent three emigrant wagon trails and are collectively referred to as the California, Oregon, Mormon Pioneer NHT) and the Pony Express NHT (a mail delivery route) follow the same general primary route across Wyoming. The California, Oregon, Mormon Pioneer NHTs and the Pony Express NHT are the only NHTs that cross the proposed alternatives. The individual trails deviate from the primary route in various locations throughout

the analysis area. Therefore, for the purposes of this analysis, researchers analyzed all four trails together as the primary route and discussed their respective deviations individually. One associated historic emigrant trail also crosses the APE: the Central Overland Trail, which diverges from the California, Oregon, Mormon Pioneer NHTs in Nebraska and is a proposed additional route on the California NHT that has yet to be designated by Congress and is referred to as a candidate NHT.

The BLM RSFO and BLM KFO have delineated specific protection zones for historic trails (BLM 1997, 2010a). Specifically, surface disturbance is prohibited within either 0.25 mile or the visual horizon (whichever is closer) for historic trails. In addition, blading is not allowed on historic trails unless to protect life or property, and historic trails may not be used for industrial access or haul roads. Exceptions, waivers, and modifications to this limitation may be approved through consultation with the BLM RSFO and BLM KFO.

3.7.1.2 *Resources and Places of Tribal Significance*

Resources and places of Tribal significance include traditional cultural places (TCPs), sacred sites, and resources of traditional religious and cultural importance. TCPs are physical properties or places that are eligible for the NRHP and that have historical and continuing importance for and are associated with the beliefs, customs, practices, and/or cultural identities of existing communities (NPS 2012; Parker and King 1998). TCPs are most often identified with Native American communities but can also reflect other types of historical communities (NPS 2012). As defined by EO 13007, the term sacred site “means any specific, discrete, narrowly delineated location on federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site.” Sacred sites and resources of traditional religious and cultural importance may or may not be eligible for the NRHP.

In general, Native American traditional resources can include archaeological sites; stone alignments; petroglyphs and pictographs; plant, wildlife, and lithic resource collection areas; spiritual sites; and locations that may have spiritual or cultural meanings to Native Americans. Previous ethnographic research suggests that resources of Native American concern may include places named in oral histories or legends, such as rock formations and the confluence of rivers; human-constructed features and sites, such as petroglyphs and pictographs, burials, cairns, vision quest structures, medicine wheels, game drive systems, and prehistoric habitations; landscapes, views, and battlefields; and locations used for religious areas, such as plant harvesting locations and stone and clay deposits (Gulliford 2000; Parker and King 1998).

Known resources of traditional religious and cultural importance within the direct and indirect analysis area are relatively rare with only a handful having been previously identified by archaeologists. These resources include stone circles and alignments and cairns. Typically, BLM field offices delineate protection zones for TCPs, sacred sites, and/or resources of traditional religious and cultural importance. These protection zones would include 1) designated no surface occupancy (NSO) zones to prevent surface-disturbing activities from occurring in these areas and 2) controlled surface use zones for which the type and amount of surface disturbance is designated, and use is subject to special operating constraints. However, there are no designated NSO zones within the direct or indirect analysis areas or the BLM KFO for Native American sacred sites. No Native American TCPs have been documented in the direct or indirect analysis areas or in the BLM KFO.

3.7.2 Environmental Consequences

3.7.2.1 Analysis Method

To understand the kinds and number of cultural resources, historic trails, and resources of Native American concern that could be impacted by the Project, an intensive literature review of existing information was conducted as set forth in BLM Manual 8110 (BLM 2004d); no new field surveys were conducted for this analysis. The literature review focused on all federal, state, and private lands in the PLSS sections containing the direct and indirect analysis areas and identified both previously surveyed areas and previously recorded cultural resources, historic trails, and sites of Native American concern. The information was compiled from SHPO Wyoming Cultural Records Office and BLM databases, as well as from WyoTrack, the SHPO's online cultural resource database, review of BLM General Land Office plats, and from in-house records maintained by Western Archaeological Services (Kautzman 2022, 2023). All site and inventory spatial data were processed and integrated into a geodatabase for analysis. Data limitations associated with this literature are discussed in detail in Kautzman (2022:10–11; 2023:6–7) but primarily include incomplete, inconsistent, incorrect, or missing data, including spatial data, in the SHPO Wyoming Cultural Records Office database.

The number of projected sites within the direct analysis area for each action alternative was also calculated based on the results of the literature review. To calculate the number of projected sites, site density was calculated per alternative based on the number of known sites per 100 acres surveyed (total sites $\times$ 100 $\div$ total acres surveyed). This estimated site density was then applied to the total analysis area acreage for each action alternative to get the total number of projected sites for each action alternative (Table 3.7-4).

Table 3.7-4. Analysis Area for Direct Impacts by Alternative

Sites and Area	Alternative B (Proposed Action)	Alternative C	Alternative D
Number of known sites	444	295	250
Surveyed acreage	4,316	5,862	2,127
Sites per 100 acres (n)	10.3	5.0	11.8
Direct analysis area acreage	7,413	7,445	7,697

Note: n = number.

Visual impacts of Project elements on cultural resources where setting and feeling are contributing aspects of integrity, including historic trails and sites of specific concern to Native Americans, were evaluated based on Appendix C of the State Protocol (BLM and SHPO 2014), which contains guidelines for determination of visual effects of an undertaking on the integrity of setting and feeling. Visual impacts could be categorized as no contrast, weak contrast, or moderate/strong contrast.

The following assumptions were used for the analysis of impacts to cultural resources:

- Cultural resources would continue to be newly identified within the APE.
- Cultural resources that have been previously recorded within the APE for the Proposed Action and each alternative are generally representative, in terms of type, location on the landscape, and number and density, of those located in previously non-surveyed portions of the proposed corridors.

- Impacts to all types of cultural resources, including historic trails and resources of Native American concern, were considered regardless of their eligibility for the NRHP.
- The Project could lead to surface-disturbing activities, which could adversely impact cultural resources, including buried resources, and the potential to reveal unanticipated discoveries of buried cultural materials.
- Cultural resources as a whole would be managed according to the management goals and objectives of the Rock Springs RMP (BLM 2024c), Kemmerer RMP (BLM 2010a), the Project Programmatic Agreement (Appendix G), and guidance contained in the BLM 8100 Manual Series (BLM 2004b), BLM 1780 Manual and Handbook (BLM 2016a, 2016b), State Protocol (BLM and SHPO 2014), NHPA Section 106 regulations at 36 CFR 800, and the statewide historic preservation plan (Wyoming SHPO 2016).
- NHTs would be managed under the guidelines and stipulations in BLM Manual 6280 (BLM 2012b), the *Comprehensive Management and Use Plan Final Environmental Impact Statement: California National Historic Trail, Pony Express National Historic Trail. Management and Use Plan Update, Final Environmental Impact Statement: Oregon National Historic Trail Mormon Pioneer National Historic Trail* (1999 Comprehensive Management and Use Plan) (NPS 1999), and through the USFS Scenery Management System, “which includes landscape character descriptions and scenic integrity objectives for landscapes that can be used to help assess the compatibility of a proposed project with the surrounding landscape” (BLM n.d. [2020]; also see USFS 1996, 2003).
- TCPs, sacred sites, and resources of traditional and cultural importance would also be managed under the guidelines and stipulations contained in BLM 1780 Manual and Handbook (BLM 2016a, 2016b), the NHPA, EO 13007 (Indian Sacred Sites), Native American Graves Protection and Repatriation Act, Archaeological Resources Protection Act of 1979, EO 13175 (Consultation and Coordination with Indian Tribal Governments), and other relevant laws and regulations.
- Historic trails often comprise numerous routes rather than a single trace. Zones within trails that are protected from effects begin at the outer edges of trails rather than at a centerline, which is difficult to define.
- Surface-disturbing activities for any potential development would be prohibited or restricted within NSO or controlled surface occupancy areas identified in the Kemmerer RMP (BLM 2010a) or Rock Springs RMP (BLM 2024c) as applicable.
- Potential visual effects on the setting of historic trails, including NHTs; sites of specific concern to Native Americans, including TCPs, sacred sites, and resources of traditional religious and cultural importance; and other historic properties, such as National Historic Landmarks, where setting is an important aspect of the resource’s integrity, would be guided by Kemmerer RMP (BLM 2010a) or Rock Springs RMP (BLM 2024c) stipulations and management practices, as applicable.
- Atmospheric impacts to cultural resources would be the same as or similar to atmospheric effects described in Section 3.3.2.
- Regardless of landownership, an unexpected discovery of cultural resources during construction shall be brought to the attention of the responsible BLM authorized officer immediately, although different landownerships would dictate whether state or federal laws are followed. Work would be halted near the find to avoid further disturbance to the resources while the appropriate authorities are contacted, resources are evaluated, and appropriate mitigation measures are developed.

The following analysis is limited in that all cultural resource data used in the analysis are derived from existing data; no new field surveys were conducted for this analysis. Additional identification efforts for the approved action and Tribal consultation (as needed) would be needed to make formal determinations about how cultural resources, including sites of Native American concern, would be affected.

3.7.2.2 *Alternative A (No Action)*

Under the No Action Alternative, no additional expansion onto BLM- or USFS-administered lands would occur. No ground disturbance would occur, and there would be no changes or alterations to the landscape; therefore, there would be no impacts to cultural resources. Existing conditions and trends in the analysis area would continue.

3.7.2.3 *Alternative B (Proposed Action)*

Cultural Resources

Potential impacts to cultural resources could include direct and permanent ground disturbance associated with the construction of the mine well field, pipeline corridors, rail line, processing facilities, access roads, transmission line, and other related infrastructure. Direct permanent disturbances could also be due to changes in public accessibility (i.e., the introduction of new or improved access roads). Potential impacts to cultural resources could also include indirect and permanent disturbances from changes in public accessibility and indirect and long-term visual, atmospheric, and auditory intrusions. These impacts 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 avoided.

Impacts to resources and places of Tribal significance are the same as those identified for cultural resources and historic trails. However, additional considerations include physical impacts or visual, auditory, and/or olfactory intrusions into Tribally sensitive areas and landscapes; impacts to sacred sites that would affect the characteristics that make such sites sacred, such as viewshed; changes to resource availability resulting from alteration of faunal and floral habitats and migration patterns; and interruption or prevention of access to important locations due to construction or use of Project infrastructure.

Adverse effects to historic properties would be avoided, minimized, or mitigated, as determined through compliance with Section 106 of the NHPA, implementation of the Programmatic Agreement (Appendix G), and development of a Historic Properties Treatment Plan. Consultation between the Wyoming SHPO, BLM, USFS, Pacific Soda, and affected Tribal groups, among others would be required under Section 106 of the NHPA. This consultation must be completed prior to the start of construction activities. The Project proponent has developed an Unanticipated Discoveries Plan (Appendix A of the Programmatic Agreement [Appendix G of the EIS]) detailing the process for addressing the identification of previously unidentified potential historic properties, such as archaeological sites, historic features, or unidentified human remains during construction. Such a plan would include steps for preventing further harm to previously unidentified sites and notifying consulting parties in order to address impacts to potential historic properties.

Under Alternative B, 444 known cultural resources, including five known resources or places of Tribal significance, and 763 projected cultural resources, including a total of 107 projected resources or places of Tribal significance, could be directly and indirectly impacted by Project activities through physical and visual, auditory, and olfactory effects (Table 3.7-5). These resources comprise precontact (85.6%), historic (11.5%), and multicomponent (2.9%) resources. Of the total known resources, 14.6% are eligible for the NRHP or contribute to the status of an NRHP-eligible linear resource, 69.2% are not eligible or do

not contribute to the status of an NRHP-eligible linear resource, and 16% are unevaluated. Of the known resources or places of Tribal significance, as a subset of cultural resources, 20% are eligible for the NRHP, 60% are not eligible for the NRHP, and 20% are unevaluated for the NRHP. One resource within the Alternative B indirect analysis area is listed in the NRHP.

Eight known NRHP-eligible resources (i.e., historic properties) are present within the Alternative B footprint and would be physically impacted by construction associated with the Proposed Action. All eight historic properties are precontact open camp sites.

Sixty-six known NRHP-eligible resources (i.e., historic properties) are present within the Alternative B analysis area and could incur visual, auditory, or atmospheric impacts associated with construction of the Proposed Action. These historic properties include precontact and historic.

Table 3.7-5. Number and General Age of Cultural Resources Projected by Alternative

Resources	Alternative B (Proposed Action)	Alternative C	Alternative D
Precontact resources	380	255	196
Historical resources	51	29	42
Multicomponent resources	13	11	12
Total resources	444	295	250
Resources per 100 acres surveyed (n)	10.3	5.0	11.8
Projected resources for direct analysis area (n)	763	375	908

Note: n = number.

Historic Trails

Under Alternative B, the California, Oregon, Mormon Pioneer, and Pony Express NHTs and the Overland Trail could be impacted by Project activities, specifically through physical, visual, and atmospheric effects, because these trails are present within the direct and indirect analysis areas (Table 3.7-6).

Table 3.7-6. Summary of National Historic Trails and Other Significant Historic Trails within the National Historic Trail Analysis Area

Historic Trail/Road	Contributing Segments	Unevaluated Segments	Alternative B (Proposed Action)	Alternative C	Alternative D
California, Oregon, Mormon Pioneer NHT/Pony Express NHT	0	3	Present	Present	N/A
Route Name: 48SW827					
Overland Trail	1	11	Present	Present	Present
Route Name: 48SW1226					

Note: N/A = not applicable.

Impacts to NHTs and other historic trails are the same as those identified for cultural resources as a whole, although with specific consideration of the impact on the trail tread, related artifacts or features, and associated sites. Direct and indirect impacts can result from a variety of natural and human-caused events, such as those that physically alter, damage, or destroy all or part of historic trails; those that improve access, bringing increased use to an area and altering characteristics of the surrounding

environment that contribute to the historic trail's importance; and the introduction of visual or audible elements out of character with the historic trail or that alter its setting.

A variety of modern linear infrastructure, including natural gas pipelines, electric transmission lines, and smaller utility-distribution lines, already crosses these trails and roads in multiple locations. Additional crossings resulting from the Project infrastructure could physically disturb or destroy the tread of these trails and roads, as well as associated cultural materials or resources.

Potential visual impacts that would disturb the historic or primitive setting and viewshed of the trails would include large swaths of cleared land, improvement of and/or increased use of existing access roads and construction of new access roads, and chemical treatments of the vegetation in the linear infrastructure corridors that create a noticeable contrast across the landscape; use of high-intensity lighting during Project construction and operations; and construction of aboveground facilities that would be visible within the viewshed of the trail(s).

3.7.2.4 *Alternative C*

Cultural Resources

The types of direct and indirect impacts to cultural resources would be the same under Alternative B and Alternative C. However, because Alternative C has lower estimated site density (Table 3.7-4), fewer resources are anticipated to be directly or indirectly impacted under Alternative C than under Alternative B.

Under Alternative C, 295 known cultural resources, 149 fewer known cultural resources than under Alternative B, and 375 projected cultural resources, 388 fewer than under Alternative B, would be impacted (Table 3.7-5), including 125 fewer known precontact resources, 22 fewer known historic resources, and two known multicomponent resources. Additionally, 15 fewer known NRHP-eligible resources, 93 fewer known non-eligible resources, and 41 fewer known unevaluated resources would be impacted. Alternative B and Alternative C would result in indirect impacts to the same NRHP-listed resource.

Nine known NRHP-eligible resources (i.e., historic properties) are present within the Alternative C footprint and would be physically impacted by construction associated with Alternative C. Eight of these historic properties are precontact open camp sites and one is a precontact lithic scatter; one of these resources also has Tribal resources associated with it.

Fifty-one known NRHP-eligible resources (i.e., historic properties) are present within the Alternative C analysis area and could incur visual, auditory, or atmospheric impacts associated with construction of Alternative C. These historic properties include precontact, historic, and Tribal resources.

When considered as a subset of cultural resources overall, the types of direct and indirect impacts to resources or places of Tribal significance would be less under Alternative C than under Alternative B. When compared to Alternative B, Alternative C would directly impact one fewer known resource or places of Tribal significance and indirectly impact 42 fewer known such resources or places. Alternative C would directly and indirectly impact two such resources that are eligible for the NRHP, whereas Alternative B would only directly and indirectly impact one NRHP-eligible resource. Alternative C is anticipated to impact 43 fewer projected resources or places of Tribal significance than Alternative B.

Historic Trails

The types of direct and indirect impacts to NHTs and other trails would be the same as those described for Alternative B and Alternative C. Under Alternative C, the California, Oregon, Mormon Pioneer, and Pony Express NHTs and the Overland Trail could be impacted by Project activities specifically through physical, visual, and atmospheric effects, because this trail is present within the direct and indirect analysis areas (Table 3.7-6).

3.7.2.5 *Alternative D (Preferred Alternative)*

Cultural Resources

The types of direct and indirect impacts to cultural resources would be the same under Alternative B and Alternative D. Under Alternative D, 192 fewer known cultural resources, consisting of 29 fewer NRHP-eligible resources, 130 fewer resources that are not eligible for the NRHP, and 33 resources that are unevaluated for the NRHP, are anticipated to be directly impacted than under Alternative B (Table 3.7-3). This is because more resources have been identified via survey in the Alternative B direct impact analysis area than in the Alternative D impact analysis area, in part because more acreage has been surveyed in Alternative B than has been surveyed in Alternative D. However, Alternative D has a greater estimated site density than Alternative B (Table 3.7-4); therefore, more resources are projected to be directly and indirectly impacted under Alternative D than under Alternative B. Unlike Alternative B, Alternative D would not result in indirect impacts to any NRHP-listed resources.

Nine known NRHP-eligible resources (i.e., historic properties) are present within the Alternative D footprint and would be physically impacted by construction associated with Alternative D. Eight of these historic properties are precontact open camp sites and one is a precontact lithic scatter, one of these resources also has Tribal resources associated with it.

Thirty-four known NRHP-eligible resources (i.e., historic properties) are present within the Alternative D analysis area and could incur visual, auditory, or atmospheric impacts associated with construction of Alternative D. These historic properties include precontact, historic, and Tribal resources.

When considered as a subset of cultural resources overall, the types of direct and indirect impacts to resources or places of Tribal significance would be the same under Alternative B and Alternative D. When compared to Alternative B, Alternative D would directly impact the same number of known resources or places of Tribal significance and indirectly impact 10 more known such resources or places. Alternative D would directly and indirectly impact two such resources that are eligible for the NRHP, whereas Alternative B would only directly and indirectly impact one NRHP-eligible resource. Alternative D is anticipated to impact nine more projected resources or places of Tribal significance than Alternative B.

Historic Trails

The types of direct and indirect impacts to NHTs and other trails would be the same under Alternative B and Alternative D, although four fewer trails would be directly or indirectly impacted under Alternative D than would be under Alternative B. Under Alternative D, the Overland Trail could be impacted by Project activities, specifically through physical, visual, and atmospheric effects, because this trail is present within the direct and indirect analysis areas (Table 3.7-5). The California, Oregon, Mormon Pioneer, and the Pony Express NHTs would not be impacted under Alternative D.

3.7.2.6 *Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity*

Unavoidable adverse impacts would be incurred under each action alternative during construction and operations of the Project. Activities associated with all action alternatives have the potential to cause surface disturbance and impact cultural resources over the short and the long term if these alternatives are developed. Physical effects primarily include displacement, destruction, or disturbance of surface and subsurface cultural materials and exposure or burial of resources through increased sedimentation or erosion. Once incurred, these impacts would be permanent (irreversible) because of the nonrenewable nature of in situ cultural resources.

All action alternatives have the potential to cause visual, auditory, or atmospheric effects to cultural resources by introducing modern industrial elements, which could adversely affect their traditional setting, feeling, and association within their historic context. Such effects would be more pronounced and long term for aboveground infrastructure in regular use but could be limited in both effect and duration (irretrievable) if the cause of the effect is mitigated or removed.

Implementation of the NHPA Section 106 process requires federal agencies to consider the effects of their actions on historic properties (including archaeological sites) that are listed, or are considered eligible for listing, in the NRHP. Federal agencies also must consult with Native American Tribes, the Advisory Council on Historic Preservation, interested members of the public, and applicable SHPOs. This can help identify processes or practices that could reduce effects to cultural resources through identification of historic properties; avoidance, minimization, or mitigation measures; and implementation of those measures. Implementation of minimization or mitigation measures would potentially provide scientific value through data gathering, preservation, and curation, but may result in the partial or complete destruction of such resources, limiting or removing their significance from the cultural landscape and their ability to contribute to cultural heritage through preservation, recreation, or continued incorporation into Tribal practices.

For the Project, implementation of the Section 106 process would be guided by the Final Programmatic Agreement developed for the Project among the BLM, the Wyoming SHPO, and Pacific Soda, as well as other consulting and concurring parties (Appendix G). The Programmatic Agreement outlines the actions that have been or will be taken for each step of the Section 106 process, including the following:

1. Initiation of consultation with federal, state, and local agencies, including the applicable SHPO(s), Native American Tribes, the Advisory Council on Historic Preservation, and interested members of the public or advocational organizations (36 CFR 800.3).
2. Identification of historic properties, those resources eligible for or listed in the NRHP, within the area of potential effect (36 CFR 800.4).
3. Assessment of the effect(s) of the Project on historic properties in the APE, including both direct and indirect effects.
4. Resolution of adverse effects on historic properties through the development, evaluation, and implementation of avoidance, minimization, and mitigation measures.

Initiation of the Section 106 process began with the establishment of the undertaking (§ 800.3) following publication of the NOI in the *Federal Register* in April 2022 by the BLM, which is the lead federal agency for Section 106 compliance for the undertaking. As provided for in 36 CFR 800.2(d)(3), the BLM used the NEPA process to satisfy the public involvement process for Section 106 of the NHPA (16 USC 470f), and the Section 106 process was coordinated with the NEPA process, starting with public scoping. During this period, potential consulting parties were identified and notified of the Project. These parties

include the Tribes listed in Section 4.2 of this EIS, Wyoming SHPO, National Park Service National Trails Office, the United States Army Corps of Engineers (USACE) Omaha District, the USFS, the Wyoming Governor's Office, the Wyoming DEQ, the Sweetwater County Commission, the Sweetwater County Conservation District, the National Pony Express Association, the Oregon-California Trails Association, the Alliance for Historic Wyoming, the Lincoln Highway Association, the Coalition of Local Governments, Aggie Grazing LLC, Sweetwater Surface LLC, Uinta Development, Green River Livestock Company, Rock Springs Grazing Association, and Little America Hotels and Resorts.

As provided for in 36 CFR 800.4, identification of historic properties would occur within the APE for the undertaking, which is determined in consultation, is outlined in the Programmatic Agreement, and considers direct, indirect, and cumulative effects. The Programmatic Agreement allows for a phased approach for identification and evaluation of historic properties (§ 800.14(b) and § 800.4 (b)(2)) and outlines the process by which identification would occur and lists the qualifications of personnel by whom identification can be made. Identification began concurrently with the NEPA process through completion of a literature review, which included the review of existing information such as previous inventories and previously recorded sites, for the components of the Proposed Action and each of the alternatives proposed in this EIS. Identification would continue through a Class III inventory for all components of the selected alternative that do not have previous adequate inventory and regardless of the ownership (private or public) of the lands and prior to the start of construction. Right-of-entry, as appropriate, would be obtained prior to any fieldwork. The Class III inventory would be conducted by qualified archaeologists as defined in the Secretary of the Interior's Professional Qualifications and Standards (48 FR 22716) and by Tribal experts who have special knowledge and expertise concerning properties of religious and cultural significance to Tribes. During the Class III inventory, the cultural resources identified would be evaluated for their significance and assessed for their eligibility for the NRHP. Determinations of eligibility would be made in consultation; sites determined eligible for or listed in the NRHP are "historic properties," but cultural resources would be recorded regardless of their ultimate NRHP eligibility determination. However, because the identification effort would take place in stages for the Project, the identification and evaluation process would be provided for in the Programmatic Agreement and deferred until after the Record of Decision and associated approvals.

Following the conclusion of the identification effort, the undertaking is evaluated for effects on the identified cultural resources, with an emphasis on the evaluation of adverse effects on historic properties (§ 800.5). An undertaking may adversely affect historic properties if the undertaking would alter any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association through direct, indirect, or cumulative effects. The Programmatic Agreement provides guidance regarding the assessment of effects, wherein avoidance and minimization measures through Project design or redesign, relocation of facilities, or by other means in a manner consistent with the Programmatic Agreement would be applied to historic properties prior to a determination of effect. Once adverse effects to historic properties are identified, the Programmatic Agreement provides for the development of a Historic Properties Treatment Plan to outline the methods by which adverse effects (direct, indirect, and/or cumulative) would be mitigated. Mitigation efforts could include, but are not limited to, the following:

- Archaeological data recovery
- Landscape photography
- Additional literature or archival research
- HABS/HAER/HALS documentation or preparation of NRHP nomination forms
- Remote sensing

- Restoration efforts or establishment of conservation easements
- Public outreach efforts, including development of brochures, interpretive signage or displays, publications, and websites, and facilitation of public site visits or off-site mitigation
- Efforts that would benefit Native American Tribes such as ethnographic studies and oral histories and educational events (Appendix B of the Programmatic Agreement)

Resolution of adverse effects provided for in the Programmatic Agreement also provides for the implementation of an Unanticipated Discoveries Plan, which is Appendix A of the Programmatic Agreement.

3.7.2.7 Cumulative Impacts

Cultural resources are non-renewable and therefore the cumulative impacts of past and present actions on cultural resources, including historic trails and resources or places of Tribal significance, and their associated settings in the analysis area, have negatively impacted the cultural landscape. Impacts to cultural resources that have resulted from past and present actions include direct impacts resulting from Project-related ground-disturbing activities, construction, erosion, contamination, increased vehicular traffic, and increased public access and unauthorized collection by looters, which have disturbed or destroyed portions of or entire resources resulting in the loss of their cultural significance and scientific value. New construction from past and present actions has resulted in visual, atmospheric, and audible intrusions to the landscape's setting, thereby resulting in indirect impacts to Tribally sensitive sites and NRHP-eligible cultural resources, such as NHTs, that possess setting as a contributing aspect of integrity.

The list of RFFAs in Appendix E includes both projects involving surface-disturbing activities that have a higher potential to result in impacts to cultural sites and cultural settings (such as Project West, the American Soda Solution Mining Expansion, or the Green River to Buckboard Fiber Optic) and projects that are unlikely to result in measurable surface disturbance and consequent impacts to cultural sites or settings (such as the multiple WYDOT paving projects along existing interstates and state routes or trail installation projects). Of the known future actions included in Appendix E that are likely to involve surface disturbance, a total of approximately 43,603 acres of new disturbance may result in adverse impacts to cultural sites and settings. This would be in addition to the possible maximum of 7,697 acres of new disturbance for the Project. When combined, the total possible disturbance of RFFAs and the Project would be up to 51,300 acres, or approximately 11% of the analysis area (460,668 acres), which may result in adverse impacts to cultural sites and settings.

The RFFAs have the potential to cause noise and visual impacts within their respective viewsheds during the life of the projects; however, noise and visual impacts associated with Project West and the American Soda Solution Mining Expansion are anticipated to have a greater impact to noise-sensitive cultural resources, because these industrial projects are in relatively undeveloped areas with a low noise attenuation range. Project West and the American Soda Solution Mining Expansion are similarly anticipated to have greater visual impacts than other RFFAs that are along developed transportation corridors, have relatively small footprints, or would be buried with disturbed areas reclaimed. These noise and visual impacts pose a risk to cultural setting of any cultural sites that are within the viewshed or the noise attenuation range of either project.

3.8 Paleontological Resources

Fossils vary in their relative abundance and distribution and not all are scientifically important. They are generally considered a scientifically important paleontological resource if they are diagnostic, rare, unique, unusual, provide new or additional stratigraphic information, or in any other way add to the

scientific knowledge of the taxon or geographic area. As defined by the Paleontological Resources Preservation Act of 2009, 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 that provide information about the history of life on earth. Paleontological resources are considered non-renewable resources because the organisms they represent no longer exist, and such resources, if destroyed, cannot be replaced. Although all fossils offer scientific information, not all provide important information.

The analysis area for direct impacts to paleontological resources consists of a 50-foot buffer around Project infrastructure areas (e.g., pipelines, transmission line, rail line, new or improved access roads, plant sites, and mine block areas) for each action alternative (Appendix Q, Figures 3.8-1–3.8-6). This analysis area is appropriate for paleontological resources, as impacts would occur in the planned disturbance locations or in the immediate area. A 0.25-mile buffer around Project linear infrastructure, including new access roads, transmission line, pipelines, and rail line, was used for indirect impacts because of the tendency for people to explore areas along authorized and unauthorized access roads or linear disturbance features. A 0.25-mile buffer was not used for the mine permit boundary because fencing would deter most people from further exploration, nor was it used for the existing access road, as they may be used regardless of Project approval. The analysis areas provide information to determine the potential to encounter unknown paleontological resources underlying the proposed Project. To provide a thorough understanding of the paleontological resources in the area, the literature review covered the geographic extent of the geologic units mapped within the analysis areas and previously recorded locality search results cover the analysis areas. Specific locality data obtained from Project survey, which represent the best available data, as well as comparable data overall, are limited to a portion of the Project footprint across the action alternatives. Survey data is available for 82.2% of Alternative B (5,195 acres), 81.0% of Alternative C (5,171 acres), and 98.3% of Alternative D (6,895 acres), with 77.4% (7,906.4 acres) of the direct analysis area covered by survey.

3.8.1 Affected Environment

The Potential Fossil Yield Classification (PFYC) is a ranking of geologic units according to their relative abundance of vertebrate, invertebrate, plant, and trace fossils that have been documented within them, with a higher classification number corresponding to a higher potential for fossil occurrences. These rankings are used in land use planning, as well as for identifying areas that may warrant special management and/or special designations. The BLM has assigned a PFYC ranking (1–5) to each geologic unit (formation, member, or other distinguishable unit) based on the taxonomic diversity and abundance of previously recorded scientifically significant paleontological resources associated with the unit and the potential for future discoveries, with a higher-class number indicating higher potential. Additional rankings are provided for geological units of unknown potential (U), water (W), and ice (I). The PFYC system provides baseline guidance for predicting, assessing, and mitigating paleontological resources in planning areas and has come to be widely used by both paleontologists and government agencies. Surface geology, such as soils and alluvium, are not always indicative of subsurface geology or the potential for paleontological resources. The layers may be thin and cover fossil-rich Pleistocene sediments, and the age of these types of units likely increases with depth. Therefore, these units may have a low potential for paleontological resources at shallow depths, but the potential may increase at depth.

The analysis areas were superimposed on digital geologic map data to determine the acreage by PFYC value (BLM 2022a; Jones and Scott 2010; Love and Christiansen 1985). If BLM-defined PFYC values were not available or not appropriate for geologic units in the Project area, adjustments were made and noted. The analysis included a review of these calculated acres of the geologic units and PFYC classes within the analysis areas; a review of Project paleontological assessment reports (KLJ Engineering [KLJ] 2020, 2021a, 2021b, 2023), literature, and online paleontological locality databases; and a qualitative assessment of potential effects on paleontological resources.

The analysis area in the Bridger Basin, a subset of the Greater Green River Basin, is bounded to the east by the north-south-trending Rock Springs Uplift, to the west by the north-south-trending Green River Basin Syncline, and to the south by the east-west Uinta Mountains Thrust Fault. BLM data (2022a), previous geological mapping (Jones and Scott 2010; Love and Christiansen 1985), and paleontological field surveys (KLJ 2020, 2021a, 2021b, 2023) indicate that the analysis area includes three mapped PFYC 2 geologic units (Quaternary mixed alluvium and colluvium and dune sand and loess and Pliocene to Quaternary terrace deposits) and six PFYC 5 geologic units (Eocene Green River Formation [Laney and Wilkins Peak Members and Tipton Shale] and Bridger Formation [undivided, and A and B members]). Table 3.8-1 summarizes the geological units in the analysis area, and Table 3.8-2 summarizes the PFYC by ownership in the analysis area.

Table 3.8-1. Summary of the Geological Units in the Analysis Area

Geologic Unit	Age	PFYC	Typical Fossils	Acres in the Analysis Area	
				Direct Analysis Area (50-foot buffer around Project footprint)	Indirect Analysis Area (0.25-mile buffer around new features)
Alluvial deposits and colluvium	Holocene to Pleistocene	2	Holocene-age deposits contain unfossilized remains of modern taxa and are too young to contain fossils but may contain displaced fossils. Pliocene and Pleistocene deposits may contain mineralized or partially mineralized remains.	587	2,590
Dune sand and loess	Holocene to Pleistocene	2		8,628	15,362
Terrace deposits	Holocene to Pliocene	2		68	759
Bridger Formation, Blacks Fork Member (Bridger A and B), with a portion mapped as undivided Bridger Formation	Eocene	5	Diverse vertebrate fauna including reptiles, fish, and numerous mammals. Numerous mollusks. Also contains plants, insect taxa, and trace fossils.	11,807	43,337
Green River Formation, Laney and Wilkins Peak Members, and Tipton Shale	Eocene	5	Contains numerous stromatolites. Vertebrates (fishes, amphibians, reptiles, bird, mammals), invertebrates (insects, arthropods, mollusks), plants, and ichnofossils.	1,100	16,808

Source: BLM (2022a); Jones and Scott (2010); KLJ (2020, 2021a, 2021b, 2023); Love and Christiansen (1985).

Table 3.8-2. Summary of the Potential Fossil Yield Classification by Ownership in the Analysis Areas

Ownership	Direct Analysis Area (50-foot buffer)			Indirect Analysis Area (0.25-mile buffer)		
	PFYC 2	PFYC 5	Total Acres	PFYC 2	PFYC 5	Total Acres
Private	1,613	3,647	5,260	4,254	18,542	22,796
Local government	0	0	0	0	0	0
State	29	110	139	127	732	859
BLM	1,812	2,988	4,801	3,561	14,229	17,790

Ownership	Direct Analysis Area (50-foot buffer)			Indirect Analysis Area (0.25-mile buffer)		
	PFYC 2	PFYC 5	Total Acres	PFYC 2	PFYC 5	Total Acres
USFS*	0	14	14	1	263	264
Unknown*	0	0	0	68	27	94
Total	3,454	6,759	10,214	8,011	33,793	41,804

Source: BLM (2022a); Jones and Scott (2010); KLJ (2020, 2021a, 2021b, 2023); Love and Christiansen (1985).

* Does not include full acreage, as a portion of the area is covered by water and those areas do not have formal PFYC rankings.

There is a long history of more than 100 years of fossil collection and geological and paleontological research within the Green River and Bridger Formations. For instance, the first publication of a Bridger Formation fossil was the description of the primate *Omomys* in 1869 by Leidy. These formations document environmental shifts from lacustrine dominate deposition of large Lake Gosiute to sediment-filled floodplain and fluvial systems with intermitted lakes. Climatic conditions during the deposition of the Tipton Shale were warm and humid; those during deposition of the Wilkins Peak Member were warm, subarid to subhumid, and changed to warm and humid with tropical affinities during the deposition of the lower Laney Member, and finally, to cooler, subhumid conditions during the deposition of the upper Laney (Bohacs et al. 2007). Represented by interbedded shale, mudstone, siltstone, algal limestone, and conglomerates, this more than 2,000-foot-thick sequence is directly overlain by the approximately 450-foot-thick Blacks Fork Member (Bridger A and B horizons) of the lower portion of the Bridger Formation and is dominated by interbedded mudstones, claystones, and siltstones, sheet sandstones, and the occasional limestone bed, indicating the presence of additional intermitted lakes after Lake Gosiute (Love and Christiansen 1985).

The Green River Formation contains an abundance of well-preserved and diverse vertebrate, invertebrate, plant, and trace fossils (Bradley 1964; Murphey and Daitch 2007). The Wilkins Peak Member was deposited during rapid repetitive expansion and contraction of Lake Gosiute in a closed-drainage basin; these lake contractions resulted in intense evaporation of the saline mudflats, and lake expansion resulted in sparsely vegetated shorelines crowded with flocks of birds, as suggested by the abundance of fossil bird bones and eggshells (Bohacs et al. 2007). Insect body fossils and larvae; fossil leaves, pollen, and algae; and tetrapod, bird, and invertebrate trackways are common (Bradley 1964; Bohacs et al. 2007). Most Green River Fossils are found in the Laney Member, and these include complete and articulated skeletons of diverse freshwater bony and cartilaginous fish; more rarely articulated skeletons of frogs, turtles, lizards, snakes, crocodiles, birds, including feather imprints; bats, rodents, primates and other mammals; invertebrates, including insect body fossils of dragonflies, moths, spiders, and butterflies; as well as fossil plants and vertebrate tracs (Murphey and Daitch 2007). No previous recorded Green River Formation localities are known to occur within the analysis areas; however, there are numerous Green River localities within the Greater Green River Basin, including near the City of Green River (Grande 1984).

The Bridger Formation, preserving one of the world's most abundant and diverse Middle Eocene vertebrate faunas, contains mainly fossil vertebrates and invertebrates with few scientifically important plant fossils in a variety of sedimentary environments (Murphey et al. 2017). Fossil vertebrates include fish (mostly disarticulated elements); amphibians (rare axial elements from frogs and salamanders); numerous reptiles (lizards, snakes, turtles, and crocodilians); bird bones and eggshells; and a very high diversity of mammals, with more than 125 species representing 77 genera, 35 families, and 18 orders (Gunnell et al. 2009; Murphey and Daitch 2007; Murphey et al. 2001; Murphey et al. 2017). Turtles, representing at least seven different families, are the most abundant fossil in many stratigraphic units (Brand et al. 2000). To further illustrate the very high potential for paleontological resources within the Bridger Formation, the search of existing data conducted prior to the paleontological field survey

concluded that seven previously recorded fossil localities are crossed by the direct analysis area and 27 additional localities are crossed by the indirect analysis area (KLJ 2020, 2021a, 2021b, 2023). The bottom portion of Table 3.8-3 includes a summary of the number of previously recorded localities in the analysis areas.

Qualified paleontologists performed paleontological pedestrian field surveys between 2020 and 2023 on approximately 69% (nearly 4,688 acres) of the Bridger Formation and Green River Formation acres in the direct analysis area (KLJ 2020, 2021a, 2021b, 2023). No Project-specific survey was conducted in the associated indirect analysis area. These areas are underlain by similar geologic units to the direct analysis area. Following BLM guidelines, the pedestrian field surveys concentrated on bedrock exposures of geologic units, the Bridger and Green River Formations, with high potential to contain paleontological resources (PFYC 5). Much of the area mapped as the Green River Formation is flat or gently sloping and covered by vegetation in the north and eastern portions of the analysis area, whereas the Bridger Formation is well exposed in southwestern portion of the analysis area in drainages and intermitted between surficial sand dune deposits in the center of the analysis area. In addition to the younger dune deposits, Quaternary alluvium, colluvium, and loess deposits cover the slopes and plains and fill drainages throughout the analysis areas. The objective of the field surveys was to look for the presence of surface fossils and potentially fossiliferous outcrops of bedrock.

During the field surveys, 726 localities were documented in the direct analysis area, and 235 of these are concentrated within 37 larger areas (or localities). An additional 68 localities were documented in the indirect analysis area, and 15 of these are concentrated within larger areas. The majority of the new localities were recorded on BLM or private lands in the Bridger Formation, although three were documented on BLM or private lands in the Green River Formation. A few of these new localities occur in previously identified paleontological resource reach areas, as approximately 17 of the localities recorded in the analysis areas during the 2020 or 2021 field surveys occupied overlapping geographical footprints of six previously recorded localities. All localities recorded in the analysis areas during the 2023 survey were newly identified. Newly documented fossils are dominated by complete, incomplete, and disarticulated turtle shells and associated limb bones; crocodile bones and teeth; fish scales and vertebrae; partial mammal jaws, teeth, and limb bones; snail and clam shells; invertebrate tracks, trails, and/or burrows; silicified stems and wood; and trace stromatolites. Within the analysis area, fossils are typically within the mudstones and siltstones and fewer turtles and other fossils also occur within the thin-bedded sandstones and limestones (KLJ 2020, 2021a, 2021b, 2023). Snails and clams are usually found within the limestones, with turtles often eroding out of the calcareous mudstone, and sandy mudstone beds immediately overlying and underlying these limestones. Most of the vertebrate fossils encountered are large pieces of turtle carapace with fewer small, isolated skeletal elements or fragments. Where most abundant, the turtles and other vertebrate fossils often occur in laterally restricted concentrations in the calcareous beds overlying or underlying the limestones. Many complete and fragmented turtles carapaces and isolated carapace fragments were also observed within the mudstones and claystones that make up most of the Blacks Fork Member. Few fossils (mostly turtle) occur locally in channel sandstone deposits with evidence of fluvial transport.

Scientifically significant or important fossils were collected from 44 localities during the field survey within the direct analysis area; 16 of these were concentrated within eight larger areas. Currently, at least 123 localities (73 of these are concentrated within 22 larger areas) within the direct analysis area and two additional localities within the indirect analysis area contain exposed scientifically significant fossils. During the 2020 field survey, paleontologists documented looting at two of the new localities that were located within approximately 0.5 mile of existing roads or two-track roads; the two scientifically important mammalian limb bones initially documented were lost to science (KLJ 2020). Table 3.8-3 provides a summary of the number of known localities by ownership and scientific significance. The results of the literature review, previously recorded locality search, and the field surveys indicate that in

addition to surface fossils, buried paleontological resources are likely present. The high potential for subsurface fossils is also supported by additional scientifically important fossils exposed within the analysis area between the 2020 and 2021 field seasons (KLJ 2021a).

Table 3.8-3. Summary of Paleontological Localities in the Analysis Areas

Localities	Number within Direct Analysis Area (50-foot buffer of Project footprint)	Status	Number within Indirect Analysis Area (0.25-mile buffer new features)	Status
Previously recorded				
Private land all	5	Not described	15	Not described
BLM-administered lands all	7	Not described	18	Not described
Newly recorded*				
Scientifically significant				
Private land	117	None collected	117	None collected
BLM-administered lands	39	26 collected; 6 not collected	42	35 collected; 7 not collected
Scientifically important				
Private land	143	None collected	147	None collected
BLM-administered lands	63	11 collected; 52 not collected	70	11 collected; 59 not collected
Scientifically insignificant				
Private land	173	None collected	161	None collected
BLM-administered lands	191	1 collected, prior to confirming significance	173	1 collected prior to confirming significance
Total localities (previously recorded, new [significant, important, and insignificant])	733	39 collected; 694 not collected; full status of previous is unknown	743	41 collected; 576 not collected; full status of previous is unknown

Source: KLJ (2020, 2021a, 2021b, 2023).

* *Significant*: Collected or should be collected due to scientific importance. *Important*: Fossil specimens that may be scientifically important, but due to fragmentary, poor quality, and/or few pieces, they may or may not have been collected. *Insignificant*: Fossil specimens with very few, very poor, or very fragmentary material that are unidentifiable and have low scientific value and were not collected; due to turtles being so prolific, few and/or fragmentary shell material was considered insignificant (provided for 2020 localities, per KLJ [2021c]). Based on 2020 designations and 2021 reports (KLJ 2021a, 2021b) it is inferred that all 2021 and 2023 fossil localities not described as significant and not collected are insignificant.

3.8.2 Environmental Consequences

3.8.2.1 Analysis Method

The analysis area was superimposed on an existing digital geologic map dataset containing BLM-designated PFYC values (BLM 2019c). The analysis included a review of these calculated acres of the geological units and PFYC classes within the analysis area; a review of the baseline paleontological survey reports for the Project (KLJ 2020, 2021a, 2021b, 2023), literature, and online known paleontological locality databases; and a qualitative assessment of potential effects on paleontological resources. Potential impacts to paleontological resources are discussed qualitatively.

Acres of PFYC classes, based on mapped geologic units, provide a realistic estimate of the potential for paleontological resources in specific locations, assuming the areal extent of geologic units with potential

to contain these resources traversed by the proposed Project footprints is proportional to the potential for impacts to these resources. Adverse impacts may occur to fossils in any unknown or moderate to very high potential formation impacted by disturbance.

It is not usually possible to determine the exact location of exposed fossils in an area without a pedestrian field survey. Baseline systematic paleontological resource survey has been conducted for Alternative B, Alternative C, and Alternative D. Corridor-specific paleontological localities searches would be conducted on a case-by-case basis as future ground-disturbing projects are proposed. Locality data cannot be made public, but fossil assemblages can be described.

Although agencies have procedures and policies for reducing or mitigating impacts to paleontological resources on a project-specific basis, there are potential benefits to a coordinated approach through more consistent environmental analyses and mitigation requirements. Depending on agency and landowner specifications, the potential for impacts to paleontological resources increases with reduced agency oversight and project-required review, assessment, and mitigation of these resources.

3.8.2.2 *Alternative A (No Action)*

Under the No Action Alternative, no additional expansion onto BLM- or USFS-administered lands would occur. No ground disturbance would occur, and there would be no changes or alterations to the landscape; therefore, there would be no impacts to paleontological resources. Existing conditions and trends in the analysis area would continue.

3.8.2.3 *Alternative B (Proposed Action)*

Impacts during ground-disturbing activities (e.g., vegetation removal, grading, trenching, heavy equipment traffic) associated with construction could cause damage or loss of scientifically important fossil resources through direct physical impact (e.g., crushing or breaking) and could cause the erosion of fossils from exposed bedrock in areas of cleared vegetation or graded slopes. Within the analysis area, there are areas of existing surface and subsurface disturbance from multiple land uses (e.g., existing roads, pipelines, transmission lines, oil and gas facilities, mining, ranching and farming activities); within these areas, known surficial paleontological resources may have been previously impacted or mitigated; however, as described above, erosion of these previously disturbed areas may cause previously covered resources to be exposed. In general, shallow ground-disturbing activities in areas with thick vegetation have a lower potential to impact important paleontological resources, as compared to areas with bedrock exposures. The BLM corridor stipulation for no surface disturbance or development on slopes greater than 25% generally reduces the potential impacts to paleontological resources than if disturbance was concentrated in areas with higher relief.

Increased human activity during future Project construction may impact paleontological resources through unauthorized collection or destruction of fossils by those accessing the analysis area or adjacent lands. Increased access may continue after construction as vegetation removal, road improvements, new roads, and two-track roads used for future Project construction and maintenance may be used for other purposes. Postconstruction, indirect effects to paleontological resources could occur from increased, unsupervised human activity through unauthorized collection or damage of paleontological resources. Increased human activity could indirectly affect paleontological resources for the long term through increasing unauthorized surface collection of paleontological resources or ground disturbance. This could occur at known or at newly exposed paleontological localities to be identified during future site-specific analysis.

A pedestrian survey and additional desktop analysis, including a previous locality search, of areas of proposed disturbance are needed to identify actual impacts to known paleontological resources. The Kemmerer RMP discusses a Project-specific analysis, which includes pedestrian field surveys, prior to ground-disturbing activities in areas underlain by PFYC 4 and 5 geological units and on a case-by-case basis in areas underlain by PFYC Class 3 geological units. Based on the results of Project-specific pedestrian surveys, avoidance or collection of important paleontological resources, as well as construction monitoring, may be necessary.

Under Alternative B, 89 scientifically significant or important fossil localities and 571 scientifically insignificant fossil localities would be directly impacted. In addition, under Alternative B, 3,215.16 acres (44.70 %) of PFYC 2 classification and 3,968.04 acres (55.17%) of PFYC 5 classification would be directly impacted (Table 3.8-4). In addition, 6,479.09 acres (22.97%) of PFYC 2 classification and 21,575.39 acres (76.48%) of PFYC 5 classification could be indirectly impacted (Table 3.8-5).

Table 3.8-4. Direct Area of Potential Fossil Yield Classification by Alternative

PFYC	Alternative B (Proposed Action)		Alternative C		Alternative D	
	Acres	Percentage	Acres	Percentage	Acres	Percentage
2	3,215.16	44.70%	3,200.85	43.73%	2,867.20	37.25%
5	3,968.04	55.17%	4,109.17	56.15%	4,829.63	62.75%
Water	8.79	0.12%	8.79	0.12%	0	0%

Note: May not add to 100 due to rounding error.

Table 3.8-5. Indirect Area of Potential Fossil Yield Classification by Alternative

PFYC	Alternative B (Proposed Action)		Alternative C		Alternative D	
	Acres	Percentage	Acres	Percentage	Acres	Percentage
2	6,479.09	22.97%	5,978.01	20.59%	6,254.24	28.53%
5	21,575.39	76.48%	22,899.52	78.87%	15,670.43	71.47%
Water	156.40	0.55%	156.40	0.54%	0	0%

Note: Does not add to 100 due to rounding error.

3.8.2.4 *Alternative C*

Direct and indirect impact types would be the same for Alternative C as for Alternative B because disturbance could result in the loss and destruction of scientifically significant or important fossils. Direct and indirect impacts by PFYC acreage and percentage would be similar between Alternative C and Alternative B (Tables 3.8-4 and 3.8-5), because the geological units crossed would be identical, although the Project footprints vary slightly between Alternative B and Alternative C. Alternative C would directly impact 141.13 (0.98%) more acres of scientifically significant (PFYC 5) geological units than would be impacted under Alternative B. Alternative C would also indirectly impact 1,324.13 (2.39%) more acres than Alternative B.

Alternative C would impact similar numbers of scientifically significant or important fossils and more scientifically insignificant fossils than Alternative B. Under Alternative C, 93 scientifically significant fossil localities (versus 89 under Alternative B) and 651 scientifically insignificant fossil localities (versus

571 under Alternative B) would be directly impacted. Many of the same fossil localities occur in both Alternative B and Alternative C due to the overlap in the direct analysis areas for these alternatives.

3.8.2.5 *Alternative D (Preferred Alternative)*

Direct and indirect impact types would be the same for Alternative D as for Alternative B because disturbance could result in the loss and destruction of scientifically significant or important fossils. The percentage of direct and indirect impacts to PFYC acreage in the analysis areas would be similar between Alternative D and Alternative B (Tables 3.8-4 and 3.8-5), because the geological units crossed would be similar though not identical. Impacts by analysis area acreage for direct and indirect impacts, respectively, would vary more, because the analysis areas for Alternative B (28,210.87 acres) contains substantially more acreage than the analysis areas for Alternative D (21,924.68 acres). Alternative D would directly impact 861.59 (7.33%) more acres of scientifically significant (PFYC 5) geological units than would be impacted under Alternative B. However, Alternative D would indirectly impact 5,904.96 (5.01%) fewer acres than Alternative B.

Alternative D would also impact fewer scientifically significant or important fossils and scientifically insignificant fossils than Alternative B. Under Alternative D, three scientifically significant fossil localities (versus 89 under Alternative B) and 48 scientifically insignificant fossil localities (versus 571 under Alternative B) would be directly impacted.

3.8.2.6 *Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity*

Although implementation of mitigation measures would reduce effects to paleontological resources and potentially provide scientific value through preservation and curation, removal of the paleontological resources or destruction of previously unknown resources would be an unavoidable, irreversible adverse effect. Protection measures required and enforced on agency-administered land surface would provide for the long-term sustainability of this resource.

3.8.2.7 *Cumulative Impacts*

The cumulative impacts of past and present actions on paleontological resources in the planning area are represented by the description of the existing affected environment. RFFAs with the potential to impact paleontological resources include all surface-disturbing activities that could result in impacts to fossils or geologic formations. The list of RFFAs in Appendix E includes both projects involving surface-disturbing activities in undisturbed and/or high PFYC areas that have a higher potential to result in impacts to paleontological resources (such as Project West, the American Soda Solution Mining Expansion, or the Green River to Buckboard Fiber Optic before the BLM RSFO) and projects that are unlikely to result in measurable disturbance in undisturbed areas and have consequential impacts to paleontological resources (such as the multiple proposed pavement improvement projects along existing interstates and state routes).

Of the RFFAs listed in Appendix E that are likely to involve surface disturbance, a total of approximately 43,603 acres of new disturbance may result in adverse impacts to paleontological resources. This would be in addition to the possible maximum of 7,697 acres of new disturbance for the Project. However, it should be noted that the Kemmerer RMP includes requirements to minimize or avoid impacts to paleontological resources and to maintain the long-term sustainability of this resource.

3.9 Vegetation Resources

Vegetation resources include vegetation communities, special status plants, and noxious weeds where vegetation communities reflect the plant communities, both native and nonnative, that occur across the landscape as terrestrial land cover.

Special status plants are defined here as those granted additional protections by federal agencies or additional considerations by the State of Wyoming. Specifically, special status plant species include all federally protected (i.e., endangered and threatened) species, BLM sensitive species, and Wyoming Natural Diversity Database (WYNDD) Species of Concern and Species of Potential Concern. Plants, like animals, are subject to ESA federal regulations; if an action on private lands has a federal nexus, that federal agency must consider any federally listed plant species to ensure that authorization of that action does not jeopardize the continued existence of that species. The BLM manages certain sensitive species that are not federally listed as threatened or endangered to prevent or reduce the need to list them as threatened or endangered in the future, to ensure sensitive species are considered in land management decisions, and to prioritize needed conservation work (BLM 2010b). The State of Wyoming does not have any statutes establishing protections for native plant species and does not list native plants as Species of Greatest Conservation Need (SGCN) in its *State Wildlife Action Plan* (Wyoming Game and Fish Department [WGFD] 2017a); however, the State of Wyoming maintains the WYNDD to track plant Species of Concern that are vulnerable to extirpation at the global or state level due to their rarity, inherent vulnerability, or existing threats, as well as Species of Potential Concern that appear to be secure at present but could become vulnerable in the future due to their limited distribution (University of Wyoming 2023).

The Wyoming Weed and Pest Council, a result of the Wyoming Weed and Pest Control Act, provides support and leadership for integrated management of noxious weeds to protect economic and ecological resources in the State of Wyoming. The Wyoming Weed and Pest Council defines noxious weeds as plants that are “detrimental to the health or welfare of Wyoming due to their ability to aggressively invade native plant communities and/or agricultural crops, be injurious or poisonous to livestock, carry disease or parasites, or negatively impact management of agricultural systems and/or natural ecosystems.” The Wyoming Weed and Pest Council comprises 23 weed and pest districts in the state that correspond with county boundaries. Plants are designated as noxious weeds depending on the following regulatory schemes:

- State-designated weeds and pests are considered of such detriment to the state that each is designated by an executive board of directors and the Wyoming Weed and Pest Council.
- County-declared weeds or pests are considered a detriment to a district.

The analysis area for vegetation is defined by the following:

- Merge all alternatives (Alternatives B, C, and D) together into one layer to account for all scenarios (Project area).
- Use the extent of all HUC-12 watershed boundaries that capture all lands that surround the Project area.
- All lands within the greater HUC-12 boundary define the spatial extent of the vegetation analysis area (Appendix Q, Figure 3.9-1).

This analysis area was selected because it provides the appropriate context for which to evaluate impacts to vegetation from Project-related disturbance considering that plant communities are interconnected

components of the larger ecological landscape that expands beyond the proposed Project disturbance. In total, there are 460,902.3 acres in the vegetation analysis area.

3.9.1 Affected Environment

Below is a discussion of the existing conditions for vegetation resources within the analysis area based on desktop analyses using publicly available datasets and the results of technical reports prepared for the Project.

3.9.1.1 Vegetation Communities

Vegetation communities in the analysis area were identified and described using land cover data developed by the USFS through a multiorganization program known as LANDFIRE, which includes datasets that provide spatial reference and descriptive data for characteristics of the land surface using predictive landscape models based on extensive field-referenced data, satellite imagery, and biophysical gradient layers (LANDFIRE 2023). LANDFIRE Existing Vegetation Types (EVTs) represent complexes of plant communities that tend to co-occur within landscapes with similar ecological processes, substrates, and/or environmental gradients. The EVT's and their associated acres within the entire analysis area are provided in Table 3.9-1. There are three primary EVT's that directly intersect with the Project components: Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Semi-Desert Shrub-Steppe, and the Inter-Mountain Basins Mat Saltbush Shrubland. Descriptions of these EVT's are provided in more detail below. Vegetation communities associated with wetlands are not discussed in this section but are covered in Section 3.10.

Table 3.9-1. Acreages of Existing Vegetation Types that Comprise the Analysis Area

Existing Vegetation Types within the Analysis Area	Acres per Existing Vegetation Type
Inter-Mountain Basins Big Sagebrush Shrubland	264,231.2
Inter-Mountain Basins Mat Saltbush Shrubland	38,198.4
Inter-Mountain Basins Shale Badland	30,045.7
Inter-Mountain Basins Big Sagebrush Steppe	20,652.7
Inter-Mountain Basins Semi-Desert Shrub-Steppe	20,283.4
Inter-Mountain Basins Cliff and Canyon	17,463.5
Inter-Mountain Basins Mixed Salt Desert Scrub	13,677.6
Open Water	7,991.6
Inter-Mountain Basins Greasewood Flat	6,089.3
Developed	6,086.9
Inter-Mountain Basins Playa	3,804.3
Inter-Mountain Basins Active and Stabilized Dune	3,760.8
Urban	2,500.7
Other	26,116.2
Total	460,902.3

Inter-Mountain Basins Big Sagebrush Shrubland

This ecological system typically occurs in broad basins between mountain ranges, plains, and foothills within soils that are deep, well-drained, and non-saline. These shrublands are dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) in Wyoming with potential for scattered juniper (*Juniperus* spp.), black greasewood (*Sarcobatus vermiculatus*), and saltbush (*Atriplex* spp.) present in some stands. Rubber rabbitbrush (*Ericameria nauseosa*) and green rabbitbrush (*Chrysothamnus viscidiflorus*) may be present on disturbed sites (NatureServe 2023a). Perennial herbaceous components typically contribute less than 25% of the vegetative cover, and common herbaceous species include Indian ricegrass (*Achnatherum hymenoides*), blue grama (*Bouteloua gracilis*), thickspike wheatgrass (*Elymus lanceolatus*), needle and thread grass (*Hesperostipa comata*), basin wildrye (*Leymus cinereus*), western wheatgrass (*Pascopyrum smithii*), and Sandberg bluegrass (*Poa secunda*) (NatureServe 2023a).

Inter-Mountain Basins Semi-Desert Shrub-Steppe

This ecological system typically occurs at lower elevations on alluvial fans and flats with moderate to deep soils. This semi-arid shrub-steppe is typically dominated by herbaceous species with an open shrub to moderately dense woody layer. The most widespread species is bluebunch wheatgrass (*Pseudoroegneria spicata*), and other characteristic grasses include Indian ricegrass, blue grama, desert saltgrass (*Distichlis spicata*), Sandberg bluegrass, muttongrass (*Poa fendleriana*), alkali sacaton (*Sporobolus airoides*), needle and thread grass, James' galleta (*Pleuraphis jamesii*), and Salina wildrye (*Leymus salinus*) (NatureServe Explorer 2022b). The woody layer is often a mixture of shrubs and dwarf-shrubs, although it may be dominated by a single species. Characteristic species include fourwing saltbush (*Atriplex canescens*), big sagebrush, yellow rabbitbrush, rubber rabbitbrush, broom snakeweed (*Gutierrezia sarothrae*), and winterfat (*Krascheninnikovia lanata*). Forbs are generally of low importance and are highly variable (NatureServe Explorer 2022b).

Inter-Mountain Basins Mat Saltbush Shrubland

This ecological system occurs on gentle slopes and rolling plains on arid basins and plains across parts of Wyoming with soil substrates that are generally shallow, saline, alkaline, fine-textured and developed from shale or alluvium and may be associated with shale badlands. This system typically supports dwarf-shrublands composed of stands of saltbush species, including Gardner's saltbush (*Atriplex gardneri*), and, to a lesser extent, shadscale (*Atriplex confertifolia*) or fourwing saltbush. Other shrub species that may be present include birdfoot sagebrush (*Artemisia pedatifida*), winterfat, shortspine horsebrush (*Tetradymia spinosa*), or Wyoming big sagebrush (NatureServe 2023c). The herbaceous layer is typically sparse and scattered perennial forbs occur. Common perennial grasses include Indian ricegrass, desert saltgrass, squirreltail (*Elymus elymoides*), thickspike wheatgrass, western wheatgrass, James' galleta, Sandberg bluegrass, or alkali sacaton. In Wyoming, inclusions of non-saline, gravelly barrens or rock outcrops dominated by cushion plants, such as Hooker's sandwort (*Arenaria hookeri*) and Hood's phlox (*Phlox hoodii*) without dwarf-shrubs, may be present.

3.9.1.2 Special Status Plants

Neither Alternative B nor Alternative C falls within the Area of Influence for the federally threatened Ute ladies'-tresses (*Spiranthes diluvialis*), as determined through coordination with USFWS and BLM biologists who verified that the species is not expected in the area (Real West 2020, 2021). However, in summer 2023, the Blacks Fork and Green River Crossings of Alternative D were surveyed for Ute ladies'-tresses, as this narrow riparian wetland zone is considered potential habitat. No individuals of the species were identified in these areas (Real West 2023). No federally threatened, endangered, candidate, or proposed plant species were observed in the proposed Project disturbance areas surveyed in 2020 (Real

West 2020, 2021) or 2023 (Real West 2023). Therefore, it is determined for all alternatives that there would be no effect to the Ute ladies'-tresses.

Several BLM sensitive species and WYNDD Species of Concern or Species of Potential Concern may be present within the Project area (Table 3.9-2). The BLM defines a sensitive species as a species that is at risk of becoming listed under the ESA. The BLM works cooperatively with other federal, state, and nongovernmental organizations to proactively conserve these species and to ensure that activities on public lands do not contribute to the need for their listing under the ESA. Representatives from the BLM and Pacific Soda and their consultants agreed upon a rationale for determining which special status plant species would be surveyed based upon known populations and presence of suitable habitat. The agreed upon special status plant species that would be targeted for surveys for Alternatives B and C included fullstem (*Chamaechaenactis scaposa*), opal phlox (*Phlox opalensis*), and Trelease's milkvetch (*Astragalus racemosus* var. *treleasei*) (Real West 2020, 2021). For Alternative D, target species included fullstem, opal phlox, Trelease's milkvetch, and Payson's beardtongue (*Penstemon paysoniorum*) (Real West 2023).

Pacific Soda consultants completed surveys of potentially suitable habitats for several of the target special status plant species (fullstem, opal phlox, and Trelease's milkvetch) along the Project's linear features for Alternatives B and C and within the mining and processing area in 2020 and 2021 (Real West 2020, 2021). Surveys were conducted again for all four target plant species (fullstem, opal phlox, Trelease's milkvetch, and Payson's beardtongue) in 2023 for areas where Alternative D's linear features did not overlap with the areas surveyed for the other alternatives in previous years (Real West 2023). Surveys identified two special status plant species within the Alternative B, C, and D Project areas: fullstem and opal phlox. Although Trelease's milkvetch was not observed within areas surveyed for target special status plant species, marginally suitable habitat was determined to be present in the form of a small shale outcrop area along the proposed rail line for Alternatives B and C. Alternative D had few semi-barren areas with broken angular shale, but none that closely resembled the habitat required for Trelease's milkvetch. Furthermore, Payson's beardtongue's habitat is described as barren hills, sandy creek bottoms, alkaline shale bluffs, and dry hills in sagebrush and desert shrub plant communities (Real West 2023). Although this habitat occurs in the Project area, surveys did not identify any populations of Payson's beardtongue (Real West 2023).

For Alternatives B and C, opal phlox was observed near and within the mine permit boundary, processing facility boundary, and the associated access roads, rail line, and overhead transmission lines (Real West 2020, 2021). For Alternative D, opal phlox was observed near and within the mine permit boundary, processing facility boundary, and the solution pipeline/water pipeline/transmission line/access road alignment (Real West 2023). For Alternatives B and C, fullstem was observed within the mining permit boundary, the proposed rail line, associated access roads, and the overhead transmission line boundaries (Real West 2020, 2021). For Alternative D, fullstem was observed within the mining permit boundary and the solution pipeline/water pipeline/transmission line/access road alignment boundary south of I 80 (Real West 2023).

It should be noted that opal phlox has vegetative characteristics that are very similar to a more common species known as Hood's phlox, and it was not possible to confidently identify most of the phlox plants encountered during the surveys as positively opal phlox or positively Hood's phlox. It was determined that "even if only a small proportion of the occurrences of phlox [species] recorded by the survey within the Project boundary are actually Opal phlox, the species is apparently relatively widespread in its distribution within the Project boundary" (Real West 2020).

Additionally, the revised Ashley LMP lists two plant species of conservation concern—desert glandular phacelia (*Phacelia glandulosa* var. *deserta*) and Owenby's thistle (*Cirsium owenbyi*)—that may occur on

lands managed by Ashley National Forest in the Flaming Gorge NRA in the analysis area. Desert glandular phacelia commonly occurs on outcrops of the Green River Formation but may also occur on river deposits or conglomerates of the Bridger Formation (NatureServe 2023i). Owenby's thistle can be found in juniper, sagebrush, and riparian communities and is associated with the Weber and Morgan formations (NatureServe 2023j). Desert glandular phacelia and Owenby's thistle are likely to be found in the Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Semi-Desert Shrub-Steppe, and Inter-Mountain Basins Mat Saltbush Shrubland EVTs (NatureServe 2023i, 2023j).

Table 3.9-2. Potential Special Status Plant Species within the Project Area

Common Name	Scientific Name	Federal Status	BLM Status	State Status (WYNDD)
Trelease's milkvetch	<i>Astragalus racemosus</i> var. <i>treleasei</i>	Not listed	Sensitive	Species of Concern
Fullstem	<i>Chamaechaenactis scaposa</i>	Not listed	Not listed	Species of Concern
Long-awned alkali wildrye	<i>Elymus simplex</i> var. <i>luxurians</i>	Not listed	Sensitive	Species of Concern
Opal phlox	<i>Phlox opalensis</i>	Not listed	Not listed	Species of Potential Concern
Beaver rim plox	<i>Phlox pungens</i>	Not listed	Sensitive	Species of Concern
Winward's narrow leaf goldenweed	<i>Ericameria discoidea</i> var. <i>windwardii</i>	Not listed	Sensitive	Species of Concern
Entire-leaved peppergrass	<i>Lepidium integrifolium</i> var. <i>integrifolium</i>	Not listed	Sensitive	Species of Concern
Large fruited bladder pod	<i>Lesquerella macrocarpa</i>	Not listed	Sensitive	Species of Concern
Prostrate bladder pod	<i>Lesquerella prostrata</i>	Not listed	Sensitive	Species of Concern
Tufted twinpod	<i>Physaria condensate</i>	Not listed	Sensitive	Species of Potential Concern
Dorn's twin pod	<i>Physaria dornii</i>	Not listed	Sensitive	Species of Concern
Hairy or Uinta greenthread	<i>Thelesperma pubescens</i>	Not listed	Sensitive	Species of Concern
Dainty rockcress	<i>Boechera gracilenta</i>	Not listed	Not listed	Species of Concern
Ownbey's thistle	<i>Cirsium ownbeyi</i>	Not listed	Sensitive	Not listed
Narrowstem cryptantha	<i>Cryptantha gracilis</i>	Not listed	Not listed	Species of Concern
Rollins' cryptantha	<i>Cryptantha rollinsii</i>	Not listed	Not listed	Species of Concern
Spiny greasebush	<i>Glossopetalon spinescens meionandrum</i>	Not listed	Not listed	Species of Concern
Payson's beardtongue	<i>Penstemon paysoniorum</i>	Not listed	Not listed	Species of Concern
Desert glandular phacelia	<i>Phacelia glandulosa deserta</i>	Not listed	Not listed	Species of Concern
Hoary phacelia	<i>Phacelia incana</i>	Not listed	Not listed	Species of Concern
Low greenthread	<i>Thelesperma caespitosum</i>	Not listed	Sensitive	Species of Concern
Ute ladies' tresses	<i>Spiranthes diluvialis</i>	Threatened	Threatened	Species of Concern

Source: Real West (2020, 2021, 2023).

3.9.1.3 Noxious and Invasive Plant Species

Noxious weeds are species of nonnative or invasive plants regulated by a jurisdictional body that can alter habitat structure, exclude native plants, decrease availability of water and forage for both plants and wildlife, and ultimately disrupt the functionality of native plant communities and soil structures, biology, and function. Invasive plant species and noxious weeds have the potential to negatively impact biological resources and wildlife and livestock management and are regulated as a result. There are currently 30 state-designated noxious weeds in Wyoming and additional weeds designated as declared weeds in every county in Wyoming (Wyoming Weed and Pest Council 2018). In Sweetwater County, there are 10 county-listed noxious weeds (Wyoming Weed and Pest Council 2019).

While conducting vegetation surveys, site reconnaissance, and other surveys within portions of the vegetation analysis area, species identified as noxious weeds in the State of Wyoming and in Sweetwater County were noted within the proposed disturbance areas for Alternatives B and C between 2019 and 2021 (Real West 2020, 2021). Most notable among these species were cheatgrass (*Bromus tectorum*), tamarisk (*Tamarix chinensis*), Russian olive (*Elaeagnus angustifolia*), and perennial pepperweed (*Lepidium latifolium*). Foxtail barley (*Hordeum jubatum*), common reed (*Phragmites australis*), and wild licorice (*Glycyrrhiza lepidota*) were the only Sweetwater County-listed noxious weeds observed.

It is important to note that the EVTs described above (Section 3.9.1.1) are susceptible and are threatened by nonnative invasive species, especially invasive annual grasses (e.g., cheatgrass). These invasive species typically increase post-disturbance and can permanently alter fire regimes, leading to a loss of native plant composition, especially woody shrub cover, such as sagebrush (NatureServe 2023a, 2023b, 2023c).

3.9.2 Environmental Consequences

3.9.2.1 Analysis Method

Project scoping identified several vegetation resource issues for detailed analysis. How would vegetation removal, disturbance, and other Project-related activities during construction and operations affect native plant communities? What would be the impacts of the construction, operations, and reclamation on the introduction and spread of invasive species and noxious weeds? How would vegetation removal and disturbance during construction, operations, and reclamation affect sensitive plant species and their suitable habitat? To determine these impacts, Project impact-causing elements were first determined, which include the following:

- Short- and long-term ground disturbance could affect native vegetation assemblages through direct mortality of plant individuals or alteration of the ecological context of the landscape.
- Ground disturbance could affect the potential for introduction or spread of invasive species and noxious weeds.
- Ground disturbance of sensitive plant species habitat could lead to direct mortality of plant individuals and/or reduce the population viability through a reduction in suitable habitat.

To quantify these impacts, this analysis used the following metrics:

- Acres of native vegetation communities (as estimated by EVTs) disturbed by community type and by disturbance type (short term versus long term).
- Qualitative assessment of increased spread and/or establishment of noxious and invasive plant due to Project impacts.

3.9.2.2 **Alternative A (No Action)**

Under the No Action Alternative, no additional expansion onto BLM- or USFS-administered lands would occur. No ground disturbance would occur, and there would be no changes or alterations to the landscape; therefore, there would be no impacts to vegetation resources. Existing conditions and trends in the analysis area would continue.

3.9.2.3 **Alternative B (Proposed Action)**

Impacts to the vegetation environment from construction, operations, and decommissioning associated with the Proposed Action would include disruptions to native plant communities, potential introduction and spread of native and noxious plant species in previously healthy vegetative communities, and loss of individuals and loss of habitat for special status plant species. Construction, operations, and decommissioning activities would create ground disturbance in the Project footprint, which would directly impact the underlying native plant communities. Direct disturbance would result in clearing and grading for Project components, which would result in ground disturbance and subsequent removal of underlying vegetation. Disturbance from human activities, such as the use of heavy equipment, movement of soil, and construction of roads, rail line, and transmission lines, as well as the potential introduction or spread of noxious and invasive species, would cause changes to the existing vegetation composition across the Project footprint. This would likely result in a decrease of native plant composition and an increase in invasive and noxious plant presence and cover.

Impacts to EVTs from Alternative B are displayed on Figure 3.9-2 (Appendix Q). Alternative B's footprint would result in 6,481 acres of disturbance to native plant communities (Table 3.9-3). These disturbances would be due to short- and long-term impacts from components of the Project (Table 3.9-3). Short- and long-term impacts are classified according to the anticipated start date of reclamation. For Alternative B, short-term impacts would be associated with the construction phase of Project infrastructure, such as the water supply pipeline, transmission line, rail line, and natural gas pipelines. Infrastructure construction could potentially take up to 2 years, after which reclamation would begin. Impacts resulting from mine operations would be significantly longer and are hereafter referred to as long-term impacts. These impacts would be caused by the mining operations within the Project area, the rail line and siding ROW, and the mine site access road. Reclamation for the operations within the Project area would be staggered and commence once each mining phase is complete. The earliest estimated completion of reclamation for Phases 1, 2, and 3 is 19 years, 24 years, and 27 years, respectively, from the Project's commencement. Reclamation work for the remaining Project infrastructure, such as mine processing facilities within the Project area, the mine site access road, and the rail line and siding ROW, would not start until 35 years after the Project's commencement. Additionally, at 35 years, the water supply pipeline, transmission line, and natural gas pipeline would require decommissioning and subsequent reclamation work. This work would require re-disturbing areas that previously underwent reclamation efforts after the initial construction phase.

Table 3.9-3. Alternative B Impacts to Primary Existing Vegetation Types

EVTs within Alternative B (Proposed Action) Footprint	Short-Term Impacts (acres)	Long-Term Impacts (acres)	Total Impacts (acres)
Inter-Mountain Basins Big Sagebrush Shrubland	271.3	2,378.8	2,650.1
Inter-Mountain Basins Semi-Desert Shrub-Steppe	41.3	1,286.5	1,327.8
Inter-Mountain Basins Mat Saltbush Shrubland	53.8	931.8	985.6
Inter-Mountain Basins Cliff and Canyon	31.7	403.5	435.3

EVTs within Alternative B (Proposed Action) Footprint	Short-Term Impacts (acres)	Long-Term Impacts (acres)	Total Impacts (acres)
Inter-Mountain Basins Active and Stabilized Dune	8.2	345.6	353.8
Inter-Mountain Basins Playa	22.2	281.5	303.8
Inter-Mountain Basins Shale Badland	19.4	212.4	231.9
Urban	16.2	34.6	50.8
Inter-Mountain Basins Mixed Salt Desert Scrub	9.9	39.2	49.1
Inter-Mountain Basins Big Sagebrush Steppe	14.0	26.8	40.8
Developed	18.7	15.8	34.5
Open Water	2.3	1.1	3.4
Other*	13.4	38.4	51.8
Total	522.4	5,996.0	6,518.7
Total (excluding developed and open water EVT's)	501.4	5,979.1	6,480.9

* Other communities predominantly consist of shrub (e.g., sagebrush and saltbush) and/or grassland communities.

The time frame for total restoration of the plant community is dependent on the post-disturbance successional dynamics of the communities experiencing disturbance from the Project. Estimated time frames for restoration of primary plant communities in the analysis area are shown in Table 3.9-4. It is crucial to note that sagebrush, may necessitate 25 to 75 years for successful recovery to take place (Nelson et al. 2013). Saltbush (the primary component of the Inter-Mountain Basins Mat Saltbush Shrubland), however, can reestablish 2 to 5 years post-disturbance (Simonin 2001). Successful restoration of EVT's with significant sagebrush components could take 27 to 110 years after the start of the Project, depending on the disturbance-causing element (short versus long term), whereas restoration of EVT's without significant sagebrush components could take 4 to 40 years depending on the disturbance causing element (short versus long term).

Table 3.9-4. Estimated Time Frame for Existing Vegetation Types Restoration from Onset of Reclamation Work

Existing Vegetation Types within the Analysis Area	Estimated Time for Restoration	Sources
Inter-Mountain Basins Big Sagebrush Shrubland	25–75 years	Nelson et al. 2013; NatureServe Explorer 2022a
Inter-Mountain Basins Mat Saltbush Shrubland	2–5 years	Simonin 2001; NatureServe 2022c
Inter-Mountain Basins Shale Badland	2–5 years, longer if birdfoot sagebrush (<i>Artemisia pedatifida</i>) is a significant component of pre-disturbance community	Simonin 2001; NatureServe 2023d
Inter-Mountain Basins Big Sagebrush Steppe	25–75 years	Nelson et al. 2013; NatureServe 2023e
Inter-Mountain Basins Semi-Desert Shrub-Steppe	2–5 years, potentially longer if <i>Artemisia tridentata</i> is a significant component of present pre-disturbance community	Simonin 2001; NatureServe Explorer 2022b
Inter-Mountain Basins Cliff and Canyon	Variable depending on woody species composition; 25–75 years if <i>Artemisia tridentata</i> is a primary woody species	NatureServe 2023f
Inter-Mountain Basins Mixed Salt Desert Scrub	2–5 years, potentially longer if <i>Artemisia tridentata</i> is a significant component of pre-disturbance community	NatureServe 2023g
Inter-Mountain Basins Active and Stabilized Dune	25–75 years, shorter if <i>Artemisia tridentata</i> is a minor component of the pre-disturbance community	NatureServe 2023h

Reclamation work for remaining Project infrastructure, such as mine processing facilities within the Project area, the mine site access road, and the rail line and siding ROW, would not start until 35 years after the Project's commencement. Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Semi-Desert Shrub-Steppe, and Inter-Mountain Basins Mat Saltbush Shrubland are known to be susceptible to invasion from nonnative grasses, such as cheatgrass and other nonnative annual species. As previously described, these nonnative plants can lead to permanent EVT conversions due to altered fire regimes (Section 3.21). The Noxious and Invasive Weed Management Plan (Appendix G of the Mine Plan) would mitigate impacts from these species; however, control of certain species (e.g., cheatgrass) even when chemical and mechanical suppression is carried out, is known to be difficult and frequently unsuccessful (Zouhar 2003). As such, post-disturbance invasion from nonnative species could permanently alter EVTs and fire regimes within and surrounding the Project area and lead to conversions of the native EVTs communities into less desirable communities. Impacts from noxious and invasive plants are discussed in more detail below.

Noxious and Invasive Plant Species

Construction and operations under Alternative B would disturb approximately 6,481 acres of previously undisturbed vegetation. Areas that have been subject to surface disturbance are susceptible to infestations by noxious and invasive plant species. Once introduced, these species can infect large areas and spread by wildlife, water, wind, humans, vehicles, and increased traffic. In addition to the Project disturbance areas, several noxious weed species have been observed within the Project area, including cheatgrass, tamarisk, Russian olive, perennial pepperweed, foxtail barley, common reed, and wild licorice. Impacts from the spread and establishment of noxious and invasive plants include decreased resilience in native plant communities. Decreased resilience reduces the ability of native plant communities to withstand disturbance (e.g., wildland fire, drought) and increases susceptibility for transition to less desirable vegetative states (e.g., annual grass dominates). Decreased resilience makes long-term restoration of the invaded communities more difficult. Woody species, such as tamarisk and Russian olive, would not be likely to present major threats to native plant communities, assuming the Noxious and Invasive Weed Management Plan (Appendix G of the Mine Plan) is successfully implemented. However, invasive annual grasses and weeds (e.g., cheatgrass and pepperweed), even with implementation of the Noxious and Invasive Weed Management Plan, are much harder to control with chemical and physical methods (Zouhar 2003). As such, these annual invasives pose the potential to permanently alter the existing vegetation communities. These changes would occur where the Proposed Action would create disturbances and then potentially spread out from the disturbed sites, leading to degradation of surrounding plant communities. These invasive plants could permanently alter fire regimes within Alternative B's footprint and the surrounding lands and lead to the loss of native plant communities. The impacts from noxious and invasive plants are ultimately dependent on the efficacy of the Noxious and Invasive Weed Management Plan (Appendix G of the Mine Plan) and reclamation work.

Special Status Plant Species

There are two special status plant species within the Alternative B boundary: fullstem and opal phlox. Although Trelease's milkvetch was not observed within areas surveyed for target special status plant species, marginally suitable habitat was present in the form of a small shale outcrop area along the proposed rail line.

Opal phlox was observed within the mining and processing area, as well as in the proposed rail line and associated access roads, water pipeline, and overhead transmission lines (Real West 2020, 2021). Fullstem was also observed within the mining and processing area, as well as the proposed rail line and associated access roads and overhead transmission lines (Real West 2020, 2021). Many of the Opal phlox occurrences were recorded in the same locations as fullstem occurrences. Opal phlox is reported to be

relatively widespread in its distribution within the Project area (Real West 2020). These observations suggest there is plentiful suitable habitat within the Project area that supports healthy populations of both species. The Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Semi-Desert Shrub-Steppe, and Inter-Mountain Basins Mat Saltbush Shrubland EVTs correspond with the occurrences of fullstem and opal phlox. Therefore, it is assumed that these EVTs provide suitable habitat for special status plant species and that short- and long-term impacts to these EVTs from Alternative B (Table 3.9-3) would result in habitat loss for these species. Furthermore, construction, operations, and decommissioning of the Project would likely cause mortality within these plant populations and result in short-term, long-term, and potentially permanent habitat loss (depending on invasive plant propagation). The overall degree of these impacts would depend upon the regional population health of these species and the efficacy of weed management and reclamation work. Overall, Alternative B would result in deleterious impacts to these species within the Alternative B footprint and surrounding lands by reducing population viability and suitable habitat. The relative impact to these species would be dependent upon the current health of the regional populations.

Trelease's milkvetch would experience minor impacts. The suitable habitat on the rock outcrop adjacent to the rail line would only experience habitat degradation. Construction of the rail line could lead to invasive plants invading its suitable habitat and limit the ability for the species to establish there.

Desert glandular phacelia and Owenby's thistle could experience minor impacts from the installation of the water supply pipeline where it crosses Ashley National Forest lands if they occur in the disturbance zone of the pipeline. USFS vegetation specialists consider these two species to be unlikely to occur in the analysis area. Installation of the water supply pipeline could lead to invasive plants invading these species' suitable habitat and limit the ability for the species to establish there.

3.9.2.4 *Alternative C*

Impacts to the vegetation environment from construction, operations, and decommissioning from Alternative C would be similar in scale to Alternative B, but, generally, would be slightly greater in cover and extent.

Impacts to vegetation communities would be similar to those described for Alternative B, but the larger scale of Alternative C's Project footprint would result in greater disturbance to underlying vegetation communities. Both short- and long-term impacts to EVTs from Alternative C are provided in Table 3.9-5. Impacts to EVTs from Alternative C are also displayed on Figure 3.9-3 (Appendix Q).

Table 3.9-5. Alternative C Impacts to Primary Existing Vegetation Types

Existing Vegetation Types within Alternative C Footprint	Short-Term Impacts (acres)	Long-Term Impacts (acres)	Total Impacts (acres)
Inter-Mountain Basins Big Sagebrush Shrubland	289.5	2,379.0	2,668.5
Inter-Mountain Basins Semi-Desert Shrub-Steppe	54.9	1,285.9	1,340.8
Inter-Mountain Basins Mat Saltbush Shrubland	62.7	931.9	994.5
Inter-Mountain Basins Cliff and Canyon	40.0	403.8	443.8
Inter-Mountain Basins Active and Stabilized Dune	24.0	345.6	369.7
Inter-Mountain Basins Playa	17.1	281.1	298.2
Inter-Mountain Basins Shale Badland	32.9	212.7	245.5
Inter-Mountain Basins Mixed Salt Desert Scrub	9.6	39.2	48.8
Inter-Mountain Basins Big Sagebrush Steppe	21.1	26.8	47.9

Existing Vegetation Types within Alternative C Footprint	Short-Term Impacts (acres)	Long-Term Impacts (acres)	Total Impacts (acres)
Developed	16.3	24.7	41.0
Inter-Mountain Basins Greasewood Flat	4.6	20.6	25.1
Urban	4.3	4.8	9.0
Open Water	2.3	1.1	3.4
Other*	19.2	47.7	66.9
Total	598.5	6,004.9	6,603.1
Total (excluding developed and open water EVTs)	575.6	5,974.3	6,549.7

* Other communities predominantly consist of shrub (e.g., sagebrush and saltbush) and grassland communities.

Noxious and Invasive Plant Species

Impacts to noxious and invasive plant species would be similar to those described for Alternative B but would likely be larger in intensity due to the slightly larger footprint of Alternative C. Potential impacts would be similarly minimized under the Noxious and Invasive Weed Management Plan (Appendix G of the Mine Plan). Currently, the portion of the transmission line where it diverges from the rail line and mine site access road has not been assessed for noxious and invasive plant species. Invasive species are likely to have substantial presence where the transmission line parallels I 80. Impacts to surrounding lands from noxious and invasive plant species due to Project operations in this area would likely be negligible.

Special Status Plant Species

Under Alternative C, construction impacts on special status plants would be nearly identical to Alternative B, but the smaller scale of Alternative C could result in less potential impact to special status plant species. There would be slightly less impact to the Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Semi-Desert Shrub-Steppe, and Inter-Mountain Basins Mat Saltbush Shrubland EVTs (Table 3.9-5), which would imply slightly less impacts to opal phlox and fullstem than Alternative B. Trelease's milkvetch would experience the same potential impacts as Alternative B.

Currently, the portion of the transmission line where it diverges from the rail line and mine site access road has not been surveyed for special status plant species. Thus, occurrences of and potential impacts to special status plant species in this region are unknown.

Alternative C would result in the same impacts to Desert glandular phacelia and Owenby's thistle as Alternative B.

3.9.2.5 *Alternative D (Preferred Alternative)*

Impacts to the vegetation environment from construction, operations, and decommissioning from Alternative D would be similar in scale to Alternatives B and C, but, generally, would be greater in intensity where the Project footprint occurs. However, although the Alternative D footprint would be larger, many of the components would be clustered along a primary corridor (Appendix Q, Figure 3.9-4). This layout could result in less noxious and invasive plant impacts across the vegetation analysis area.

Impacts to vegetation communities would be similar to Alternatives B and C, but the larger scale of Alternative D's Project footprint would result in greater disturbance to underlying vegetation communities. Both short- and long-term impacts to EVTs from Alternative D are provided in Table 3.9-6. Impacts to EVTs from Alternative D are also displayed on Figure 3.9-4 (Appendix Q). Although

Alternative D could lead to more direct impacts to underlying vegetation communities, indirect impacts to vegetation communities in the analysis area would be less than Alternatives B and C (see noxious and invasive plant discussion below).

Table 3.9-6. Alternative D Impacts to Existing Vegetation Types

Existing Vegetation Types within Alternative D Footprint	Short-Term Impacts (acres)	Long-Term Impacts (acres)	Total Impacts (acres)
Inter-Mountain Basins Big Sagebrush Shrubland	630.4	3,110.5	3,740.9
Inter-Mountain Basins Semi-Desert Shrub-Steppe	55.5	1,067.8	1,123.2
Inter-Mountain Basins Mat Saltbush Shrubland	142.7	879.1	1,021.8
Inter-Mountain Basins Cliff and Canyon	50.8	316.3	367.1
Inter-Mountain Basins Active and Stabilized Dune	6.2	243.6	249.9
Inter-Mountain Basins Big Sagebrush Steppe	64.3	242.5	306.8
Inter-Mountain Basins Playa	26.0	229.7	255.7
Inter-Mountain Basins Shale Badland	48.6	176.9	225.6
Inter-Mountain Basins Mixed Salt Desert Scrub	23.1	86.6	109.6
Inter-Mountain Basins Greasewood Flat	32.4	32.2	64.6
Developed	8.6	2.1	10.7
Urban	8.2	1.3	9.4
Open Water	1.2	0.5	1.7
Other*	26.3	79.7	106.0
Total	1,124.3	6,468.8	7,593.0
Total (excluding developed and open water EVT)	1,106.3	6,464.9	7,571.2

* Other communities predominantly consist of shrub (e.g., sagebrush and saltbush) and grassland communities.

Noxious and Invasive Plant Species

Impacts from noxious and invasive plant species would be similar to Alternatives B and C but would vary in intensity. Within the Project area, Alternative D would cause less impact from noxious and invasive plants when compared to Alternatives B and C. There is uncertainty of the degree of these impacts outside the Project area, because noxious and invasive plant surveys were not conducted for the entirety of Alternative D's footprint. Potential impacts would be similarly minimized under the Noxious and Invasive Weed Management Plan (Appendix G of the Mine Plan). Impacts from noxious and invasive plant species would occur across less of the landscape than Alternatives B and C because many of the Project components would be clustered along a primary corridor (Appendix Q, Figure 3.9-4). Although the impacts from noxious and invasive plants would be more severe in Alternative D's footprint, Alternative D would result in less vectors for noxious and invasive plant introduction across the vegetation analysis area than Alternatives B and C.

Special Status Plant Species

Construction impacts on special status plants would be similar to Alternative B but would differ in several areas. Currently, there would be slightly more impacts to the Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Semi-Desert Shrub-Steppe, and Inter-Mountain Basins Mat Saltbush Shrubland EVTs (Table 3.9-4), which would imply slightly more impact to opal phlox and fullstem than under Alternative B. However, the area of Alternative D north of I 80 has no known occurrences of

fullstem and infrequent occurrences of opal phlox, which implies that the Project's impacts to the Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Semi-Desert Shrub-Steppe, and Inter-Mountain Basins Mat Saltbush Shrubland EVTs in this area may have minimal to no impacts on these species. Additionally, linear features would share an alignment, which would reduce impacts under Alternative B. Under Alternative D, Trelease's milkvetch would experience less impact than under Alternative B, as there is less suitable habitat within and near its footprint.

Alternative D would not cross Ashley National Forest lands; therefore, impacts to desert glandular phacelia and Owenby's thistle would not occur as compared to Alternative B

3.9.2.6 *Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity*

Irretrievable impacts would be associated with construction, operations, and decommissioning of the Project—all of which would cause surface disturbance to the vegetation environment. Potential impacts from these short-term uses (until restoration is complete) include loss and degradation of underlying and surrounding EVTs, population decline of special status plant species, degradation of special status plant species habitat, and increased presence of invasive and noxious plant species in the analysis area. Regarding sustaining EVT communities and providing special status plant species habitat, impacts from invasive species due to surface disturbance and subsequent spread would likely result in long-term declines of vegetation productivity, degradation of EVTs, and population declines of special status plant species within underlying and surrounding lands.

Irreversible impacts would result from the permanent loss of original underlying native vegetation, destruction and degradation of EVTs, and loss of special status plant species habitat within the underlying Project footprint. Reclamation efforts may lead to the reestablishment of native vegetation, EVTs, and special status plant species habitat, but the quality of the habitat could be permanently degraded (e.g., noxious and invasive plant species), which could cause irreversible impacts in the vegetation analysis area. Other potential irreversible impacts could occur where construction, operations, and decommissioning activities permanently change vegetation composition and the structure of EVTs due to unsuccessful reclamation efforts.

3.9.2.7 *Cumulative Impacts*

Ongoing landscape-scale phenomena, including climate change, drought, mineral extraction, and livestock grazing practices, would increasingly encroach upon altered and degraded vegetation communities compared to intact, native vegetation communities in the analysis area over time. The RFFAs listed in Appendix E would primarily cause vegetation habitat disturbance and degradation.

Surface-disturbing activities resulting from RFFAs would directly remove vegetation and elevate the likelihood of increased invasive and noxious plant cover across the landscape. This subsequent increase in invasive and noxious plant species would lead to greater degradation of EVTs and special status plant species habitats. RFFAs, such as road improvements, structure repairs, and the 4-stall Recreational Vehicle (RV) Station, would have negligible impacts on vegetation and primarily occur within developed or urban EVTs. Other RFFAs, such as the paleontological excavation (< 0.1 acre), Skyline Americans with Disabilities Act (ADA) Trail (11.0 acres), and Wilkins Peak Mountain Bike Trail Expansion (38.3 acres), would lead to minor amounts of vegetation degradation. The Green River to Buckboard Fiber Optic would cause short-term ground disturbance (2.7 acres), resulting in additional impacts on nearby EVTs and special status plant species. The extent of these RFFA impacts would depend on the efficacy of post-project reclamation work and the spread of noxious and invasive plants during construction and

operations activities. The affected EVT's would mirror the primary EVT's described for Alternatives B, C, and D.

The most notable RFFAs that could potentially cause large-scale negative cumulative impacts on vegetation would be the proposed American Soda Solution Mining Expansion (35,668 acres), Project West (3,722 acres), and the Sweetwater Carbon Storage Hub Project (3,837 acres). These mining projects are likely to result in the degradation and/or conversion of EVT's due to the propagation of noxious and invasive plants. Inter-Mountain Basins Big Sagebrush Shrubland and Inter-Mountain Basins Mixed Salt Desert Scrub would experience the most significant impacts. Furthermore, special status plant species' habitats and populations in the vegetation analysis area would suffer deleterious effects. However, the extent of impacts would depend on project specifics (e.g., project area, installation of linear features, transmission lines, etc.).

In summary, wherever there would be vegetation removal, disturbance, or alteration due to planned actions near the Project, there exists the potential for landscape-scale impacts. The severity of these impacts depends on the proximity of the planned action to the Proposed Action, the sensitivity of the vegetation community, the scale of disturbance, and other biotic and abiotic factors.

3.10 Wetlands

Wetland resources include surface water features, such as perennial, intermittent, and ephemeral streams; springs; and wetland areas. Disturbance to hydrology, soils, and vegetation that would affect the quality of wetland function and quantity of wetlands within and adjacent to the Project footprint is discussed in this section. Other water resources, such as floodplains, water quantity, and water quality, are discussed in Section 3.5, including impacts on groundwater quantity and surface hydrology systems. Riparian areas that are present in association with perennial, intermittent, or ephemeral streams, springs, or wetland areas that are not quantified as wetland because they do not meet the definition of a wetland or surface water or did not appear on the wetland mapping tools used as a basis for the analysis, are discussed in Section 3.11. Impacts to aquatic resources in relation to fisheries and aquatic ecology are presented and discussed in Section 3.11.

The analysis area for wetlands is bounded within the HUC-12 watersheds within which the Project infrastructure and disturbance footprints for the alternatives are being proposed. As shown on Figures 3.10-1 and 3.10-2 (Appendix Q), the Project footprint for the various alternatives lies within portions of the following HUC-12 subwatersheds: Chicken Springs Draw-Green River (140401060105), Town of Granger-Blacks Fork (140401071001), 140401071007-Blacks Fork (140401071007), 140401071008-Blacks Fork (140401071008), The Bluffs-Blacks Fork (140401071005), Upper Meadow Springs Wash (14040171003), Lower Meadow Springs Wash (140401071004), Middle Firehole Canyon-Green River (140401060101), Chicken Draw (140401071006), Flaming Gorge Reservoir-Blacks Fork (140401071009), Lower Big Dry Creek (140401070910), Middle Big Dry Creek (14041070907), Upper Little Dry Creek (14040170908), Lower Little Dry Creek (14040170909), Telephone Canyon-Green River (140401030610), and Milk Ranch Wash-Green River (140401030608). The 460,668-acre analysis area encompasses the boundaries of these subwatersheds to provide a context for wetland conditions and potential impacts within the greater subwatersheds within which the Project alternatives' footprints exist.

3.10.1 Affected Environment

The Project is located within the Greater Green River Basin (Basin), which covers approximately 20,000 square miles of the central Rocky Mountains and extends from southwest Wyoming to northeast Utah and into northwest Colorado. An extensive portion of the Basin is characterized by badlands, rims, and plateaus. The Project area is surrounded by the Wyoming Overthrust Belt to the west, the remainder of

the Green River Basin and the Wind River Range to the north, the Rock Springs Uplift to the east, and the Uinta Mountains to the south. The elevation varies between 6,200 and 6,400 feet amsl, with the upper extreme of approximately 7,150 feet amsl, and drops down to the lower elevation of approximately 6,050 feet amsl at the Green River.

The approximate quantity of wetlands and perennial and ephemeral streams presented in this section is based on National Hydrography Dataset (NHD) information (Appendix Q, Figure 3.10-1) and National Wetlands Inventory (NWI) results (Appendix Q, Figure 3.10-2). NHD and NWI online mapping tools identify potential wetland-type features based on remote sensing, soil, hydrology, topography, and aerial photograph interpretation and serve as a proxy for impacts to drainage networks and patterns. NHD and NWI data and mapping tools were used to compare potential impacts to wetlands and drainage networks among the alternatives.

Table 3.10-1 summarizes the NHD results for drainages (ephemeral, intermittent, and perennial) within the subwatersheds (analysis area) for Project context. Table 3.10-1 relies on the NHD categorizations system, which includes an artificial path category that does not differentiate these areas into intermittent or perennial. NHD data include 0.66 mile of perennial stream (mostly a perennial section of the Blacks Fork) and 1,783 miles of intermittent drainages that flow during storms and snowmelt within the analysis area. Table 3.10-2 presents the acres of wetlands within the analysis area mapped by the NWI tool. The wetlands in the Project area may function to provide percolation and groundwater recharge and stormwater treatment and retention, as well as to slow stormwater flow; these functions depend on site-specific wetland conditions including soils, vegetation, and hydrology.

Table 3.10-1. Miles of National Hydrography Dataset Flowlines Within the Hydrologic Unit Code 12 Analysis Area

Project Elements	Flowline (miles)
Artificial Path	157.39
Canal/Ditch	3.00
Connector	8.84
Pipeline: Pipeline Type = Aqueduct; Relationship to Surface = Underground	8.50
Stream/River: Hydrographic Category = Intermittent	1,783.65
Stream/River: Hydrographic Category = Perennial	0.66
Total	1,962.04

Source: USGS (2023a).

Notes: The acreages in this table may duplicate some of the data that are reported in the NWI data presented in Table 3.11-1. NHD includes surface waters and perennial, intermittent, and ephemeral streams which may be categorized as surface waters by Wyoming Water Quality Rules, Chapter 1, Wyoming Water Quality Standards if they meet the 3B waters definition based on site-specific observations.

Table 3.10-2. Acres of National Wetlands Inventory Potential Wetlands within the Hydrologic Unit Code 12 Analysis Area

NWI Wetland Title	Acres
Freshwater Emergent Wetland	1,029
Freshwater Forested/Shrub Wetland	302
Freshwater Ponded*	375
Lucustrine (Lake)	6,713
Riverine, Perennial and Intermittent	1,735

NWI Wetland Title	Acres
River, Ephemeral	5,654
Total	15,808

Source: USFWS (2023).

Note: The acreages in this table may duplicate some of the data that are reported in the NHD data presented in Table 3.10-1.

* *Ponded area* refers to areas that may be associated with the other wetland categories yet have indicators of unconsolidated bottom or shoreline indicative of holding moisture for extended parts of time and lack of vegetation. This does not specifically mean the area is a pond, which would likely be mapped as a lake, depending on size.

As shown on Figure 3.10-1 (Appendix Q), the Project area is drained by numerous channels associated with the subwatersheds within the analysis area, most of which are ephemeral washes due to low precipitation, windy conditions that reduce winter snow accumulation, and generally well-drained soils (Barr Engineering 2021a). The drainage pattern is from west to east and southeast toward the Green River. These drainages range from intermittent to ephemeral and include Big Dry Creek, which crosses the southern end of the proposed Project area; Little Dry Creek, which crosses the access road for the southern section of the Project area, potential transmission line, and brine pipeline; and Blacks Fork, which would cross the potential transmission line and brine pipeline. Figures 2.2-1, 2.2-3, 2.2-4, and 3.11-1 show these primary drainages (Appendix Q).

Within the analysis area, the Green River contains a mixture of lacustrine wetlands mapped within the southern portion of the drainage; a mixture of emergent wetlands that appear associated with historic oxbows; and a mixture of ponding unconsolidated areas, scattered forested/shrub wetland typical of riparian areas, and riverine within the Green River drainage channel (per NWI mapping, Appendix Q, Figure 3.10-2). The area to the north is mapped by the NHD as an artificial flow path, and the NHD does not indicate if this is perennial, intermittent, or ephemeral.

Blacks Fork similarly contains wetlands that are classified as lacustrine to the south, which are associated with the intersection with the Green River, although it is unclear if this matches current conditions. To the north are scattered ponding unconsolidated areas and scattered forested/shrub wetlands typical of riparian areas mixed with riverine. To the north, Blacks Fork is mapped by the NHD as an artificial flow path, but it does not indicate if these are perennial, intermittent, or ephemeral.

Little Dry Creek and Big Dry Creek are classified by the NWI as riverine with a potential NHD artificial flow path, but it does not indicate if these are perennial, intermittent, or ephemeral.

The following site-specific qualitative wetland information within the Project area is provided for background purposes only (see subsections below) and is based on preliminary wetland delineation efforts that were conducted in the Project area; however, NWI and NHD data are provided as the basis for the comparison of alternatives and for estimating/quantifying potential impacts. If areas are determined to fall under USACE and/or state jurisdiction as waters of the United States (WOTUS) and/or State and these areas are unable to be avoided during final engineering design of the selected alternative, these areas may require protection or compensatory mitigation, pursuant to the CWA. Section 404 and 401 of the CWA establishes a permit program for the discharge of dredged or fill material into WOTUS and waters of the State, including wetlands.

3.10.1.1 Mine Site

The mine site is located in the southern portion of the Project area and would be used by all Project alternatives to varying degrees. Other than intermittent and/or ephemeral drainage areas associated with Big Dry Creek and Little Dry Creek, as noted above, the mine site and processing area do not have NWI or NHD areas mapped within the Project footprint. However, the wetland delineation for this area did

note two floodplain wetlands adjacent to Big Dry Creek (which was noted as an intermittent stream). The report that contained the results of the delineation also stated, “Wetlands along this stream channel are infrequent because vegetation is sparse...Vegetated areas that meet all three parameters of wetlands are uncommon” (Barr Engineering 2021a). The sparse vegetation present along the channel includes coyote willow (*Salix exigua*), interspersed with yellow rabbitbrush and western wheatgrass.

Small floodplain areas observed during the wetland delineation consisted of wetland-type vegetation, such as saltcedar (*Tamarix ramosissima*), saltgrass, mountain rush (*Juncus arcticus*), Sandberg bluegrass, and foxtail barley. Some isolated wetland basins were also mapped (no surface water connection to other wetlands or tributaries), and dominant vegetation included saltgrass, mountain rush, and alkali sacaton, Nuttall’s alkaligrass (*Puccinellia nuttalliana*), and toad rush (*Juncus bufonius*).

3.10.1.2 Access Road/Railroad Corridor/Transmission Line

NWI data indicate scattered freshwater ponding areas across the watershed analysis area, and some are in proximity to the area being considered for access road alignments and the railroad corridor, yet these areas appear isolated in nature and are not in immediate proximity to proposed development features. NHD data show numerous intermittent or ephemeral channels that cross the proposed Project footprint options for these features, and culverts are proposed, and would be necessary, for some of these crossing areas. The wetland delineation for this area mapped nine intermittent channels in the linear corridor. These channels all exhibit differentiation of bed and bank with the ordinary high water mark along the banks. Banks tend to be steep and are incised from 2 to 12 feet deep compared to surrounding terrain. Stream channels are sandy and sparsely vegetated. Scouring, flow marks, and flood debris indicate intermittent flow. In some cases, flood debris is present above the ordinary high water mark and above the top of the embankment on adjacent stream terraces (Barr Engineering 2021a).

There was also an isolated wetland mapped along the access road and rail line corridor. This wetland appears to have an anthropogenic origin as an excavated artificial impoundment. It is possible the basin was excavated when a bridge over a railroad was constructed. The wetland is 0.63 acre and is classified as a palustrine persistent emergent permanently flooded wetland (PEM1H). Dominant vegetation includes common threesquare (*Schoenoplectus pungens*), softstem bulrush (*Schoenoplectus tabernaemontani*), and broadleaf cattail (*Typha latifolia*). Surface runoff from the roadway is the apparent source of hydrology. An outlet pipe was observed, but there was no evidence that indicated this overflow creates connectivity to any tributaries.

One disrupted channel was identified in the survey area. This channel appeared to be a remnant intermittent stream that may have been channelized. Flow appeared to have been disrupted so that a natural hydrological regime was no longer present. A retention basin was constructed nearby adjacent to I 80, and flow appeared to have been diverted from this channel to the basin.

A single perennial channel was mapped in the linear corridor associated with Blacks Fork that averages approximately 50 feet wide and is incised approximately 8 feet below the surrounding upland terrain. This perennial channel is classified as riverine lower perennial sand streambed (R2SB4). The floodplain along the channel supports coyote willow, but the floodplain above the ordinary high water mark does not meet the criteria of a wetland due to lack of vegetation.

3.10.1.3 Water Pipeline

The area surrounding the potential water pipeline contains no NWI- or NHD-mapped wetlands other than those associated with Blacks Fork (lacustrine portion) (as mentioned above) and the ponding, riverine, and forested shrub riparian associated with the Green River.

3.10.1.4 *Natural Gas Pipeline and Alternative D Facilities*

Alternative D facilities and the natural gas pipeline do not contain NWI-mapped wetland areas other than what has already been mentioned herein associated with Blacks Fork (riverine portion) and associated ponding and forested shrub riparian near the intersection with the I 80 corridor, as well as areas associated with the Green River (at the water extraction point). NHD data show numerous drainages that appear to connect to the Blacks Fork drainage.

3.10.2 Environmental Consequences

3.10.2.1 *Analysis Method*

The analysis area is bounded within the HUC-12 subwatersheds where the Project footprint is proposed. The purpose of the analysis area extending beyond the Project footprint is to provide context for potential wetland impacts within the surrounding watershed setting. The following analysis assumptions were made in preparation of this document:

- Direct impacts to riparian areas would be analyzed in the vegetation (Section 3.9) and/or wildlife habitat (Section 3.12) sections. Impacts to fisheries and aquatic ecological resources would be discussed in Section 3.11.
- The water resources section (Section 3.5) would address impacts to floodplains and associated water diversions, including culverts and the proposed diversion from the Green River. Comments on water diversions would be received during the NEPA process and consultations with the State Engineering Office.
- The USACE defines wetlands and WOTUS per Section 404 of the Clean Water Act, similarly to State of Wyoming definition of Waters of the State (WOS) per Wyoming Water Quality Rules, Chapter 1, Wyoming Water Quality Standards as follows: wetlands are areas that have all three of the following characteristics: 1) Hydrophytic vegetation; 2) Hydric soils; and 3) Wetland hydrology. Further, per Wyoming Water Quality Rules, Chapter 1, Wyoming Water Quality Standards, intermittent and ephemeral drainages are considered Class 3B waters where they meet the following conditions: “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 which inhabit waters of the state at some stage of their life cycles. In general, 3B waters are characterized by frequent linear wetland occurrences or impoundments within or adjacent to the stream channel over its entire length. Such characteristics will be a primary indicator used in identifying Class 3B waters.” Wetland areas considered WOTUS are subject to federal regulation whereas all wetland areas within Wyoming are considered surface waters of the state and are subject to regulation under Wyoming statutes and rules. For the purposes of this analysis, the approximate quantity of wetlands and perennial and ephemeral streams is based on NHD (miles) and NWI (acres) results with some overlap acknowledged between the two mapping tools, as a basis of comparison of impacts between alternatives, including drainage networks and patterns. A jurisdictional determination has been provided from the USACE confirming wetland delineation results and USACE jurisdiction for a portion of the Project site. Additional delineation efforts that meet both USACE and Wyoming DEQ definitions would be conducted if the selected alternative will result in impacts not already mapped within the approved jurisdictional delineation(s).

- It is assumed the nature of impacts to wetlands quantity and quality (function) will be through partial or direct fill from Project facilities as introduced in Sections 3.10.1.1 through 3.10.1.4 of the EIS. It is assumed this would result in the direct loss of wetlands (by acreage) and streams (by miles) and the complete loss of the wetland function provided up until site reclamation occurs. For analysis of potential impacts, it is assumed as a worst-case scenario that conversion to a different wetland type would not occur, yet rather the Project could result in complete removal of the wetland function for the duration of the Project. Acreage and miles of wetland loss has been calculated to quantify impacts.
- The Applicant would acquire a River and Harbors Act Section 10 permit, as administered by the USACE for impacts to the Green River (within ordinary high water marks) from any water pipeline intake structure and any jurisdictional wetland areas that are determined to be WOTUS within the Project footprint.
- The Applicant would acquire a CWA Section 404 permit, as administered by the USACE for impacts to WOTUS in the Project footprint (Nationwide Permit 27 or Individual permit, depending on the level of impact to wetlands). The Applicant would also acquire a CWA Section 401 permit from the Wyoming DEQ Water Quality Division as part of the CWA 404 permit process. For impacts to non-WOTUS areas that may remain jurisdictional under Wyoming statutes and rules, activities that result in greater than a cumulative 1 acre of permanent impact may require mitigation through the Wyoming DEQ unless those impacts are authorized by the Wyoming DEQ LQD. Wyoming DEQ will determine whether Wyoming Rapid Assessment Protocol is appropriate during mitigation design, if any is determined necessary.
- The USACE would be consulted for a jurisdictional determination for any impacts to wetlands outside areas where an approved jurisdictional determination has already been provided based on the 2020 to 2023 wetland delineation efforts (additional delineation efforts would be needed if impacts are anticipated outside areas where jurisdictional determination has already been provided). Named drainages and washes that likely would require permitting under Section 404 of the CWA (if impacts occur in these areas) include the Green River and Blacks Fork.
- The Applicant would restore all wetlands impacted by Project construction to pre-disturbance vegetation, bed elevation, and function, and will include decompaction to support wetland function. These construction-related disturbance areas are associated with portions of the rail line, water supply pipeline, construction access disturbance areas, and small linear areas along new roads; these would be restored within 1 year of completion of construction and include monitoring for 5 years to document successful restoration. All other impact areas would be restored during site reclamation. A reclamation and restoration plan to restore these areas to pre-Project conditions would be part of the decommissioning plan and would incorporate any climate-change related design specifications, if deemed appropriate at that time to incorporate climatic conditions.
- Impacts to wetlands due to actual operational activities would likely be minimal.

3.10.2.2 *Alternative A (No Action)*

Under the No Action Alternative, no additional expansion onto BLM- or USFS-administered lands would occur. No ground disturbance would occur, and there would be no changes or alterations to the landscape; therefore, there would be no impacts to wetland resources. Existing conditions and trends in the analysis area would continue.

3.10.2.3 Alternative B (Proposed Action)

Table 3.10-3 includes comparison of potential impacts to NHD-mapped ephemeral, intermittent, and perennial drainages as a result of each alternative. Table 3.10-4 includes a comparison of potential impacts on NWI-mapped ephemeral, intermittent, and perennial drainages as a result of each alternative. In both cases, miles and acreage serve as a proxy for impacts to drainage networks and patterns.

Table 3.10-3. Comparison of Project Alternatives Based on Impacts to National Hydrology Dataset–Mapped Flowlines Within Drainages

Impact Types	Alternative B (Proposed Action)		Alternative C		Alternative D		Total NHD in Analysis Area (miles)
	Impact (miles)	Percentage of NHD- mapped in Analysis Area	Impact (miles)	Percentage of NHD- mapped in Analysis Area	Impact (miles)	Percentage of NHD- mapped in Analysis Area	
Artificial path	0.81	0.52%	0.79	0.50%	0.85	0.54%	157.39
Pipeline: Pipeline Type = Aqueduct; Relationship to Surface = Underground	0.08	0.96%	0.11	1.27%	0.00	0.00%	8.50
Stream/River: Hydrographic Category = Intermittent	18.72	1.05%	19.04	1.07%	22.66	1.27%	1,783.65
Stream/River: Hydrographic Category = Perennial	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.66
Canal/ditch	0.00	0.00%	0.00	0.00%	0.00	0.00%	3.00
Connector	0.00	0.00%	0.00	0.00%	0.00	0.00%	8.84
Total	19.62	1.00%	19.94	1.02%	23.51	1.20%	1,962.04

Source: USGS (2023a).

Note: NHD information is provided in stream miles, and the dataset does not include width of drainage; therefore, acreage cannot be calculated without detailed aerial interpretation or site mapping.

Definitions from USGS (2023):

Artificial path = Abstraction to facilitate hydrologic modeling through open water bodies and along coastal and Great Lakes shorelines and to act as a surrogate for lakes and other water bodies.

Canal/ditch = an artificial open waterway constructed to transport water, to irrigate or drain land, to connect two or more bodies of water, or to serve as a waterway for watercraft.

Connector = Known, but unspecific, connection between two nonadjacent network segments.

Pipeline = Closed conduit with pumps, valves, and control devices for conveying fluids, gases, or finely divided solids.

Table 3.10-4. Comparison of Project Alternatives Based on Impacts to National Wetlands Inventory–Mapped Potential Wetland Areas

Type	Alternative B (Proposed Action)		Alternative C		Alternative D		Total NWI in Analysis Area (acres)
	Impact (acres)	Percentage of NWI- mapped in Analysis Area	Impact (acres)	Percentage of NWI- mapped in Analysis Area	Impact Acres*	Percentage of NWI- mapped in Analysis Area	
Freshwater Emergent Wetland	6.13	0.60%	6.13	0.60%	6.04	0.59%	1,029.25
Freshwater Forested/ Shrub Wetland	0.51	0.17%	0.51	0.17%	0.00	0.00%	302.09
Freshwater Ponded	0.83	0.22%	0.99	0.26%	0.00	0.00%	375.45
Lake	2.14	0.03%	2.14	0.03%	0.00	0.00%	6,712.51
Riverine, Perennial and Intermittent	1.07	0.06%	1.07	0.06%	1.30	0.07%	1,735.39
River, Ephemeral	81.71	1.45%	82.78	1.46%	91.62	1.62%	5,653.97
Total	92.40	0.58%	93.62	0.59%	98.95	0.63%	15,808.66

Source: USFWS (2023a).

*Use of NWI data are for comparison between alternatives. Site-specific delineation will determine actual wetlands considered jurisdictional by USACE and Wyoming DEQ, and surface waters of the state determined to meet the 3B waters definition. Site-specific wetlands mapping and jurisdictional determination from USACE have been secured for Alternative D but are not currently available for the other alternatives. NWI and NHD data are an overestimate of actual wetland conditions because there is overlap between NWI and NHD data sets. Additionally, USACE-jurisdictional determination for Alternative D shows much less wetlands present than mapped from remote sensing data (0.24 acre compared to the 99 acres presented in Table 3.10-4).

Of the total Project footprint associated with both Alternatives B and C, approximately 20 miles of impacts to perennial/intermittent and ephemeral washes are anticipated based on NHD mapping as shown in Table 3.10-3, which equates to approximately 1% of total flowlines mapped within the subwatershed analysis area. Alternative B would have impacts to approximately 19.6 miles of drainages, which would be less when compared to Alternative D, which would impact 23.5 miles; this is in part related to the level of necessary new road construction.

With implementation of both Alternatives B and C, a total of approximately 92 to 94 acres, respectively, of impacts are anticipated within wetland-type areas as mapped by the NWI, including lakes (lower sections of the Green River and Blacks Fork), ponding and emergent areas along washes and creeks, forested and shrub riparian areas, perennial/intermittent drainages, and ephemeral washes. In context within the subwatersheds within which the Project is proposed, this would equate to impacts to approximately 0.6% of the wetlands estimated of all classifications within the analysis area (see Table 3.10-4 for breakdown by wetland type). Both Alternative B and Alternative C would have less impacts on potential or likely wetlands when compared to Alternative D.

Once the grading plans for the site are drafted and wetland delineation is finalized for the impact area with a USACE jurisdictional determination–approved map and Wyoming DEQ approval (if necessary, depending on the final proposed Project footprint), plans would be developed for soil salvage, recontouring, revegetating, and restoring wetlands within the construction impact areas (associated with rail line and water pipeline) and longer-term operational impact areas, including new roads, landfill, ponds, well pads, constructed facilities, and other operational areas. Impacts to jurisdictional wetlands (if any) would require permitting and possibly mitigation through the USACE and Wyoming DEQ in compliance with the CWA. Regarding impacts to non-WOTUS wetlands (i.e., surface waters that meet the Wyoming DEQ definition of Class 3B intermittent or ephemeral waters of the state), these areas may

remain jurisdictional under Wyoming statutes and rules. Activities that result in greater than a cumulative 1 acre of permanent impact to non-WOTUS wetlands may require mitigation through the Wyoming DEQ unless those impacts are authorized by the Wyoming DEQ LQD. In areas that exhibit wetland-type conditions (such as ephemeral washes), these areas would be restored to pre-Project conditions per the revegetation/restoration plans.

Under all alternatives, there would be a temporal long-term net loss of wetlands and drainage areas during construction and operations, with Alternatives B and C having a smaller footprint acreage and Alternative D having a slightly higher impact footprint. Among the alternatives, Alternative B is similar to Alternatives C and D in many regards, as presented below.

Construction

Effects to wetland areas during construction, including ephemeral and intermittent drainages, would be associated with ground-disturbing activities, such as clearing, grubbing, and blading to remove vegetation within short-term impact areas associated with portions of the rail line, water pipeline, and temporary construction areas, as well as within longer-term and direct impact areas associated with all other aspects of the Project, such as the footprint of the rail line, new roads, and operation areas. This would remove wetlands from environmental function until reclamation occurs. These activities could also directly and indirectly mobilize fugitive dust and could destabilize soils in some places, which could result in erosion. Mobilization of fugitive dust and erosion could also result in the discharge of sediment to surface waters. Increased sedimentation indirectly related to ground-disturbing activities potentially could degrade the functional capacity of adjacent wetlands and riparian areas by discharging higher rates of sediment into the system than can otherwise be attenuated, filtered, and/or immobilized under normal circumstances. These impacts would occur mostly where unexpected circumstances, such as non-typical storm events, might compromise erosion-control design features or if the erosion control measures are not properly installed and maintained. Management measures to minimize these types of impact include keeping surface soils moist or covered to minimize fugitive dust and revegetating in a timely manner after impacts occur.

Similar to other water resources, such as riparian vegetation, fisheries and aquatic ecological resources, and surface water and groundwater, other indirect effects on wetlands areas could be attributed to accidental spills of environmentally harmful substances. The Mine Plan includes procedures for promptly reporting and cleaning up spills generated during construction and are further discussed in Section 3.15. Also see Section 3.5 for information related to minimization measures for water quality that are also applicable to wetlands. Work performed in wetlands (during both the construction and operations phases) that are determined to be WOTUS would require a CWA Section 404 permit issued by the USACE, which would include a regulatory nexus to minimize and avoid indirect impacts to wetlands associated with working/filling in and around wetlands.

Culverts would be installed for new roads and the rail line corridor to provide continuity in flow for existing ephemeral, intermittent, and perennial drainages and would concurrently maintain connectivity for these areas. The culverts would be a necessary component of the Project design to limit water backing up on base material and undermining facilities but would have the added benefit of maintaining hydrological connectivity and maintaining wetland ecological function on either side of the direct impact area.

Impacts to riparian vegetation (forested and shrub) are discussed in Sections 3.9 and 3.11 of this EIS. These resources would be restored within construction impact areas, as well as longer-term operations impact areas during final site reclamation. Riparian vegetation could partially be restored by using on-site

collection of willow plugs, which are present along the stream corridor; however, the sparse nature of on-site vegetation may require sourcing off-site plant material for riparian restoration.

Operations

Operational impacts to wetlands would be similar to construction in regard to dust, erosion, and hazardous materials, and similar minimization measures would apply. Other than these, operational impacts to wetlands would likely be minimal.

Decommissioning

Land managers would be contacted about the plan for final disposition/decommissioning of roads and infrastructure installed as part of the Mine Plan. A reclamation and restoration plan to restore these areas to pre-Project conditions would be part of the decommissioning plan and would incorporate any climate-change related design specifications, if deemed appropriate at that time to incorporate climatic conditions. Reclamation would include recontouring to blend with the surrounding landscape and return the site to pre-Project topography and mimic pre-Project drainage patterns, allowing restored areas to properly function as wetland areas. The decommissioning would include decompaction of soils to provide an appropriate seed bed and planting area and revegetation to restore wetland function and aesthetics and reduce erosion. The decommissioning plan would include vegetation suitable based on documentation of pre-Project conditions, as well as site-specific soil conditions at the time of reclamation, including water regime and soil salinity. Topsoil salvage from direct impact areas prior to Project construction would be used to ensure appropriate seed bed for replanting with suitable vegetation.

3.10.2.4 *Alternative C*

Alternative C would impact up to 93.6 acres of NWI-mapped wetland areas, which would be similar to the 92.4 acres anticipated to be impacted by Alternative B in type and severity (Table 3.10-4). Alternative C would impact 19.9 miles of NHD-mapped perennial/intermittent areas and ephemeral washes, which would be similar to the 19.6 miles estimated to be impacted under Alternative B (Table 3.10-3). Implementation of Alternative C would have less impacts to drainages and wetland-type areas compared to Alternative D.

3.10.2.5 *Alternative D (Preferred Alternative)*

Impacts under Alternative D would be similar to Alternative B in severity, though different areas would be impacted, because Project components, such as the water pipeline and processing facilities would be moved. Alternative D would avoid some impacts to riparian, ponding areas, and lake areas. However, Alternative D would impact 99 acres of potential wetlands, which is 7 to 8 acres more than Alternatives B and C, yet still only 0.6% of the watershed analysis area. Regarding NHD-mapped flowlines, Alternative D would also have a slightly higher impact with a total of 23.5 miles of impact to perennial/intermittent and ephemeral washes, which is approximately 3.5 miles more when compared to Alternatives B and C and equates to approximately 1.2% of this feature within the subwatershed analysis area.

3.10.2.6 *Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity*

Impacts to jurisdictional wetlands would require permitting and mitigation through the USACE in compliance with the CWA. With mitigation, the direct impacts to wetlands would be irretrievable, yet temporally reversible once restoration or mitigation occurs to compensate for the direct impact and loss of wetland acreage.

In regard to impacts to non-WOTUS areas that exhibit wetland-type features but are not USACE jurisdictional (such as isolated wet areas and/or ephemeral washes), these areas would be restored to pre-Project contours during decommissioning and reclamation, per the revegetation/restoration plans. However, there would be a temporal long-term impact during operations for these areas. This is considered an irretrievable impact, yet it is not an irreversible impact. Long-term productivity of wetlands would be restored through the reclamation process and therefore would not be an irreversible impact.

There would be no irreversible impacts to wetlands unless the mitigation requirements or reclamation plan fail at meeting the success criteria of restoration and replacement.

3.10.2.7 Cumulative Impacts

There are reasonably foreseeable trends and future actions within the analysis area that could impact the same community types impacted by the construction and operations of the Project described herein (including wetlands and hydrology of ephemeral to perennial drainages). Ongoing landscape-scale phenomena, including climate change, drought, and surface disturbing activities, would lead to further encroachment, alterations, and/or degradation to ephemeral to perennial drainages and wetland-type areas, relative to intact, natural wetland areas in the analysis area over time. Nearby planned actions, particularly within the analysis area, that would also disturb wetland areas have the potential to compound impacts from the Project. Wherever there would be vegetation disturbance or surface removal, disturbance, or alteration within wetlands and drainages from other planned actions near the Proposed Action, there is potential for landscape-scale impacts to wetland-type habitat and drainages; however, the severity of said impacts depends on the proximity of the planned action to the Proposed Action, the sensitivity of the site-specific conditions where impacts are occurring, the scale of disturbance, and other biotic and abiotic factors.

Reasonably available information for other projects was obtained and included in the cumulative impacts analysis. An estimated impact from RFFAs (Appendix E) were used to estimate total potential cumulative wetland impacts within the analysis area (the watersheds within which the Project is being sited). This assumes full loss of wetland acreage, wetland function, and hydrology, which may or may not occur in all cases and represents a worst-case scenario since the NHD and NWI data used as a basis for this comparison have overlap in mapping and calculations. For purposes of project analysis, the wetland function and acreage are assumed to be removed, yet some projects may degrade or convert wetlands without completely removing some functions that can remain even under impacted conditions. The potential cumulative disturbance acreage for quantifiable RFFAs (i.e., RFFAs for which a discrete surface disturbance area is known,) to wetlands is approximately 852 acres and approximately 197 miles of streamlines (ephemeral, intermittent, and perennial drainages combined) within the analysis area, noting that there may be overlap in these mapped acreages (per the NWI database) and mileage (per the NHD database). These potential impacts are within the context of a total of approximately 49,925 acres of potential Project footprint associated with quantifiable RFFAs within the analysis area. The estimated impacts to wetlands, in combination with the proposed Project, would result in impacts to 6% of wetlands. The estimated impacts to drainages, in combination with the proposed Project, would result in impacts to 11% of streams (again, there would likely be overlap in these two mapping methods). There is temporal variation in when these future RFFA projects would occur, and these projects would be spread out over time. Some of these projects could result in permanent disturbance to wetlands and drainages, whereas others would be temporary, and some sites where temporary impacts occur would be restored to pre-Project condition, which would allow wetlands and drainages to return to their natural functions. These projects would be guided by the Kemmerer and Rock Springs RMPs, as well as WYDOT's policies for impacts to wetlands.

3.11 Fisheries and Aquatic Resources

The biological aquatic resources covered in this section include fish and macroinvertebrates. Of these aquatic resources, this section focuses on special status fish and macroinvertebrates due to their management emphasis by the WGFD and federal agencies related to their management of public lands. Species with special status include federally listed threatened and endangered species, WGFD SGCN, BLM sensitive species and species of conservation concern, and USFS species of conservation concern. The species that may occur in the proposed Project analysis area or downstream areas affected by the Project are listed in Table 3.11-1.

Table 3.11-1. Special Status Fish and Macroinvertebrates with the Potential to be Impacted within the Analysis Area

Species	Potential to Occur
Fish	
Federally listed threatened and endangered	
Bonytail (<i>Gila elegans</i>)	None – extirpated above Flaming Gorge Dam*
Colorado pikeminnow (<i>Ptychocheilus lucius</i>)	None – extirpated above Flaming Gorge Dam*
Humpback chub (<i>Gila cypha</i>)	None – extirpated above Flaming Gorge Dam*
Razorback sucker (<i>Xyrauchen texanus</i>)	None – extirpated above Flaming Gorge Dam*
WGFD Species of Greatest Conservation Need/BLM or USFS special status species	
Bluehead sucker (<i>Catostomus discobolus</i>)	Possible – within known range
Flannemouth sucker (<i>Catostomus latipinnis</i>)	Possible – within known range
Roundtail chub (<i>Gila robusta</i>)	Possible – within known range
Colorado River cutthroat trout (<i>Oncorhynchus clarkia pleuriticus</i>) [†]	Possible – within known range
Crustaceans	
WGFD Species of Greatest Conservation Need	
Calico/papershell crayfish (<i>Orconectes immunis</i>)	Possible – range undetermined
Fairy, tadpole, and clam shrimp (many species)	Possible – range undetermined
Mollusks	
WGFD Species of Greatest Conservation Need	
Aquatic snails (many species)	Possible – range undetermined
Land snails (many species)	Possible – range undetermined
Pill or fingernail clams (many species)	Possible – range undetermined
Stagnicola pond snails (many species)	Possible – range undetermined
Green River pebblesnail (<i>Fluminicola coloradoensis</i>)	Possible – range undetermined
Ash gyro (<i>Gyraulus parvus</i>)	Possible – range undetermined
Creeping ancyliid (<i>Ferrissia rivularis</i>)	Possible – range undetermined
Dusky fossaria (<i>Fossaria dalli</i>)	Possible – range undetermined
Forest disc (<i>Discus whitneyi</i>)	Possible – range undetermined
Marsh rams-horn (<i>Planorbella trivolvis</i>)	Possible – range undetermined
Prairie fossaria (<i>Fossaria bulimoides</i>)	Possible – range undetermined

Species	Potential to Occur
Quick gloss (<i>Zonitoides arboreus</i>)	Possible – range undetermined
Subalpine mountainsnail (<i>Oreohelix subrudis</i>)	Possible – range undetermined
Umbilicate sprite (<i>Promenetus umbilicatellus</i>)	Possible – range undetermined
Western glass-snail (<i>Vitrina pellucida</i>)	Possible – range undetermined

* Baxter and Stone (1995).

† The Colorado River cutthroat trout is a USFS species of conservation concern in the Ashley LMP.

The four federally listed species (i.e., bonytail [*Gila elegans*], Colorado pikeminnow [*Ptychocheilus lucius*], humpback chub [*Gila cypha*], razorback sucker [*Xyrauchen texanus*]), although still present in the Green River drainage farther downstream of the dam at Flaming Gorge Reservoir, are listed as extirpated from Wyoming since the completion of Flaming Gorge Reservoir (Baxter and Stone 1995). Therefore, they are not listed as SGCN in Wyoming.

3.11.1 Affected Environment

According to the NHD (USGS 2023a) and NWI (USFWS 2023a) datasets, the affected environment analysis area for fisheries and aquatic resources includes two perennial streams, the Green River and the Blacks Fork River. Alternatives B and C include 6.98 river miles (11.23 km) of the Green River in the Upper Green-Flaming Gorge Reservoir Watershed (HUC 14040106), which starts at the location of the proposed water intake and continues downstream to the commonly recognized mouth of the Flaming Gorge Reservoir at Davis Bottom (Appendix Q, Figure 3.11-1). Because the proposed water intake would be located farther upstream on the Green River under Alternative D, there are 18.28 river miles (29.42 km) of the Green River included under this alternative (Appendix Q, Figure 3.11-1). Alternative D includes 9.55 river miles (15.37 km) of the Green River that are in the Upper Green-Flaming Gorge Reservoir Watershed (HUC 14040106) and 8.73 river miles (14.05 km) that are in the Upper Green-Slate Watershed (HUC 14040103). There are 75.42 river miles (121.38 km) of the Blacks Fork River in the Blacks Fork Watershed (HUC 14040107) that begin at a point representing the farthest upstream area of disturbance to the confluence with the Green River, which applies to Alternatives B, C, and D. In addition to the two perennial streams, the analysis area includes intermittent and artificial paths (i.e., canals, ditches, connectors) that intersect the proposed Project area in the Upper Green-Flaming Gorge Reservoir Watershed, the Blacks Fork Watershed, and the Upper Green-Slate Watershed. In the case of intermittent and artificial paths that may or may not actually hold or flow water, it is conservatively assumed for this analysis that they have connected water flow.

The analysis area was chosen to evaluate areas potentially impacted by instream disturbance from construction, operations, reclamation, and the water intake structure, as well as flow, water level, and water quality as it relates to biological aquatic resources. The lower end of the analysis area was selected as Davis Bottom on the Green River, which is recognized by the WGFD as the mouth of Flaming Gorge Reservoir for their management purposes. The amount of water taken from the Green River for the Project is insignificant to the overall volume of the reservoir and is not expected to impact the water releases from Flaming Gorge Dam. As such, it is not expected to directly impact biological aquatic resources below the dam.

Information used to characterize habitat within the analysis area is based on habitat priority areas identified by the WGFD, the presence of aquatic conservation areas, and the WGFD stream classification system. A portion of the analysis area is within watersheds identified as aquatics conservation areas (WGFD 2017b) (Appendix Q, Figure 3.11-2). The analysis area also contains WGFD priority watersheds (WGFD 2017c) (Appendix Q, Figure 3.11-3). Although there is an area identified as a stream restoration

hotspot, it is in reference to a Russian olive removal project and is not relevant or of impact to biological aquatic resources in the analysis area (WGFD 2017d). No portion of the analysis area is classified by the WGFD as blue ribbon streams (WGFD 2017e); however, a portion is classified as a crucial stream corridor (WGFD 2017f) (Appendix Q, Figure 3.11-4).

There are no CWA Section 303(d)–listed impaired waters in the analysis area with known impacts to fish or aquatic health (DEQ 2020).

Aquatic invasive species are nonnative aquatic species that can adversely affect aquatic species and their habitat. Aquatic invasive species of concern for the analysis area include zebra (*Dreissena polymorpha*) and quagga (*Dreissena bugensis*) mussels—two particular species of interest to the state of Wyoming. There are no known zebra or quagga mussel occurrences in Wyoming (WGFD 2021). The New Zealand mudsnail (*Potamopyrgus antipodarum*) and curly pondweed (*Potamogeton crispus*) have both been detected in Flaming Gorge (WGFD 2021), and there is a risk of introduction of other species from watercraft and anglers that have been in waters with aquatic invasive species. The WGFD has a Wyoming Aquatic Invasive Species Program that focuses on the prevention of the introduction and spread of invasive species through watercraft inspections.

3.11.2 Environmental Consequences

Potential Project impacts to fisheries and aquatics include instream disturbance from construction, operations, and reclamation of access roads and rail lines, entrainment, entrapment, and fish passage issues from the water intake structure, or flow, water level, and water quality from the anticipated water depletion of mine operations. Each of these potential impacts are discussed below for each alternative.

There are four federally listed endangered fish species (listed in Table 3.11-1) that could potentially be impacted by the alternatives. All four of these species' habitats include downstream riverine habitats of the Colorado River system. Although none of these species have occurred in Wyoming since the impoundment of the Flaming Gorge Dam in 1963, they are known to exist downstream of the dam and could be impacted by the Project upstream of the Flaming Gorge Dam. Additionally, there are four sensitive fish species and various crustacean and mollusk species listed in Table 3.11-1 that could be impacted by the Project. The distribution and population estimates of the listed crustaceans and mollusks are not currently quantified; however, the WGFD has confirmed that three of the four sensitive species (roundtail chub [*Gila robusta*], flannelmouth sucker [*Catostomus latipinnis*], and bluehead sucker [*Catostomus discobolus*]) could be found within the analysis area. However, there are no current data available on distribution or population estimates for the bluehead sucker, with the most recent records being from 2004; it is assumed unlikely that this species would be found within the analysis area. Roundtail chub was found within the analysis area north of I 80, and flannelmouth sucker was found within the analysis area south of I 80. As such, it is possible either species could be found inhabiting streams within the analysis area. Additionally, the warm water habitat of the Project area would not support the Colorado River cutthroat trout (*Oncorhynchus clarkia pleuriticus*), which prefers cooler waters.

3.11.2.1 Analysis Method

For the evaluation of potential impacts to fisheries and aquatic species, this impact analysis evaluated available aquatic habitat, potential effects of water depletion and reduced flows, and potential issues for fish passage, entrainment, and/or entrapment. Impacts to fisheries or aquatic species may occur as a result of impacts to their potential habitats, which may serve as critical spawning or foraging areas. Fisheries and aquatic species' habitats are closely tied to the ecological conditions of riparian plant communities. These plant communities occur along and in drainages and serve to moderate water temperatures, provide

erosion control through soil stability on banks, help dissipate water velocity and energy, and contribute to in-stream habitats and nutrients for macroinvertebrates (BLM 2010b). As Alternatives B, C, and D all have the same estimated water depletion, impacts due to water depletions and reduced flows are discussed in Section 3.5.2.

Impacts may also occur due to changes in water quality, including water temperature, turbidity, dissolved oxygen, and sedimentation (BLM 2010b). Changes to water quality can ultimately impact quantity and quality of available habitat for fish and macroinvertebrates. For this resource impact analysis, water quality was not considered directly but is discussed in greater detail in Section 3.5. However, all of these impacts would be non-permanent and would only relate to initial construction activities. As presented in the Mine Plan, these disturbances would be minimized or avoided through the implementation of BMPs and any stipulations for actions authorized by the agencies that may impact fisheries or aquatic species under all alternatives, which would help avoid or minimize impacts to these species. The Mine Plan details BMPs, such as minimizing the quantity and duration of soil exposure, protecting exposed soils during construction by reducing velocity of water and redirecting runoff, installing and maintaining erosion and sediment control measures, and reestablishing vegetation as soon as possible following construction activities. Construction of rail lines and access roads in Alternatives B, C, and D would also include temporary culverts to convey flows at small perennial or intermittent waterbodies with geotextile fabric and clean rick fill used to construct a temporary access road over the top. Culverts used for access roads could be single-barrel or multi-barrel, with size and type depending on the time of year, means, and methods. Additionally, temporary bridges for access roads would be necessary to span waterbodies to minimize impacts and provide temporary safe access for one side of the waterbody to the other to move equipment and materials. After completion of construction, these temporary measures would be removed. Rail lines would use culverts made of corrugated steel pipes or reinforced concrete box culverts (single- or multi-barrel). These would be permanent structures and may be oversized and include 1 foot of natural stream bottom material. With proper implementation of these erosion and sediment controls, potential sedimentation and impacts to water quality would be reduced or avoided under Alternatives B, C, and D (Appendix C).

3.11.2.2 *Alternative A (No Action)*

Under the No Action Alternative, no additional expansion onto BLM- or USFS-administered lands would occur. No ground disturbance would occur, and there would be no changes or alterations to the landscape; therefore, there would be no impacts to fisheries or aquatic resources. Existing conditions and trends in the analysis area would continue.

3.11.2.3 *Alternative B (Proposed Action)*

Under Alternative B, there would be changes or alterations to the landscape that could impact fisheries and aquatic habitats. Not including the Blacks Fork River, the Proposed Action would result in infrastructure intersecting 202 drainages (187 intermittent, 15 artificial paths) that could reduce habitat for fish and macroinvertebrates if disturbance is permanent or done without implementing BMPs. However, per the Mine Plan and detailed above in Section 3.11.2.1, these alterations would be either temporary disturbances or permanent, with necessary erosion and sediment controls in place to prevent permanent disturbances, which would result in loss of habitat or prolonged water quality issues. Under the Proposed Action, the water supply pipeline would be bored under the Blacks Fork River; there are no other linear infrastructure features crossing the Blacks Fork River with the exception of an existing access road in the southern portion of the Project area. Therefore, no disturbance to fisheries or aquatics would be expected. For the other 202 drainage crossings, the analysis estimated a conservative ROW width of 100 feet and a 15-foot general average width of channel to calculate a potential area of disturbance for each drainage crossing. Most of these drainage crossings would be significantly smaller than 15 feet across, and with the

majority of them being intermittent, they may not flow or hold water during the time of construction and therefore would not support fisheries. This conservative total estimated surface disturbance for drainage crossing is 6.96 acres. This relatively small amount of temporary surface disturbance, combined with the implementation of the BMPs described above, would largely eliminate impacts to fisheries.

Under the Proposed Action, there would be water depletion associated with the operations phase of the mine. An estimated annual 14,500 acre-feet of water depletion is expected during operation of the mine. The direct overall impact is expected to be negligible, given that the water depletion would first have to impact the water storage of Flaming Gorge Reservoir, which is controlled by the U.S. Bureau of Reclamation, before it could potentially impact downstream species and habitat. However, it would contribute to overall depletions affecting the Green and Colorado Rivers downstream of the proposed Project intake.

The estimated annual water depletion for mine operations has the potential to impact fisheries or aquatic resources downstream of Flaming Gorge Dam if the depletion in turn impacts the overall volume of water storage of the dam and what the Bureau of Reclamation releases downstream. This could vary year-to-year based on the upstream volume that reaches Flaming Gorge Reservoir. To assess the risk to fish and other aquatic species, the volume of water withdrawn by this Project was assessed relative to the average flow in the Green River and to the volume of water in Flaming Gorge Reservoir (the next major water storage in the system). Median daily discharge data from USGS gaging station 09217000 on the Green River, immediately downstream of the City of Green River, Wyoming, are available from 1952 through 2022 (USGS 2023b). The lowest daily median discharge observed at any time between 1952 and 2022 was 730 cfs, and the mean of the daily medians was 1,387 cfs (USGS 2023b). The 20 cfs withdrawal associated with this Project corresponds to 2.74% of the flows on the day with the lowest observed discharge and 1.44% of the flows on any *average day* of the year. These percentages indicate that the volume of water removed from the river at any given time is relatively small (approximately 1%–3%) relative to the total flow at that time, and thus, it would be unlikely to have a measurable impact on fish and other aquatic wildlife. Also, it is noted that during drought periods, water use would follow regulatory requirements regarding diversions from the Green River, and, if necessary, operations would cease during drought conditions upstream of the City of Green River.

The total volume of water that can be stored in the Flaming Gorge Reservoir is 3,788,900 acre-feet, and the average content for water years 2013 through 2022 was 3,175,615 acre-feet (Flaming Gorge Reservoir Water Database 2023). The annual withdrawal associated with the Project is expected to be 14,490 acre-feet. This corresponds to 0.38% of the total storage of Flaming Gorge Reservoir or 0.46% of the average storage for the past 10 water years. Relatively speaking, these withdrawals would be negligible relative to the volume of water within the reservoir and would be unlikely to have a measurable impact on fish and other aquatic species. Although water depletion is unlikely to affect releases from Flaming Gorge Dam, it could impact downstream fisheries through releases and depletion when considered cumulatively with other consumption or depletion events. The USFWS made a similar determination in their 1999 programmatic biological opinion, which analyzed the impacts related to water depletions that occur above the confluence with the Gunnison River and impact critical habitat from Rifle, Colorado, to Lake Powell and the recovery actions designed to offset these impacts (USFWS 1999). The USFWS could find that the expected water depletion from the Proposed Action, along with other depletions unrelated to the Project, has a “may effect” determination. With the expected water depletion greater than 4,500 acre-feet, the USFWS would impose a mitigation requirement that includes a standard depletion fee plus additional mitigation to support the recovery of endangered fish species within the Colorado River (Reeves 2022).

Under the Proposed Action, there could be impacts to fisheries and aquatics from the water intake structure that would be located on the Green River. This water intake structure could have entrainments and/or entrapment issues; however, based on the water intake design, the point of diversion would be on

the outside of a meander bend, which would provide a lower risk of scour and locations prone to sedimentation. Per the information provided in the Mine Plan (Appendix C), the intake would also be placed within a geological bed formation to help stabilize the structure. The water intake structure would also be equipped with screens to prevent the entrainment of small fish and young of year. With these measures in place for construction and operations, there would be low to no potential impact for entrainment and/or entrapment. The design and placement of this water intake structure has no expected impact on fish passage. BMPs would be used where appropriate, such as postconstruction monitoring and maintenance, to prevent and/or address potential issues that may arise.

Temporary surface disturbance has the potential to impact water quality, such as increased sediment pollution during the construction phase, which would clear out and result in minimal impacts to downstream habitats (water quality measures are discussed in Section 3.5). No meaningful long-term (i.e., beyond the construction phase) impact to fisheries or aquatic resources is expected from these alterations to the landscape from construction activities.

3.11.2.4 *Alternative C*

Under Alternative C, impacts would be similar to those described under Alternative B with the exception that the infrastructure intersects 177 drainages (162 intermittent, 15 artificial paths) instead of 202 drainages, which would mean proportionally less disturbance. Following the same estimation process for potential surface disturbance, the conservative total estimated surface disturbance for this alternative would be 6.10 acres.

3.11.2.5 *Alternative D (Preferred Alternative)*

Under Alternative D, impacts would be similar to those described under Alternative B with a few exceptions. The first being that the infrastructure would intersect 196 drainages (181 intermittent, 15 artificial paths) instead of 202 drainages, and, similar to Alternative B, would result in proportionally less disturbance. Following the same estimation process for potential surface disturbance, the conservative total estimated surface disturbance for this alternative would be 6.75 acres. The second difference between Alternative D and Alternatives B and C is the water supply pipeline. Unlike Alternatives B and C, the water supply pipeline under this Alternative would not cross the Blacks Fork River. However, the brine and condensate pipelines would cross Blacks Fork but at a more northern location, and they would be bored under the Blacks Fork River. Lastly, under Alternative D, the water intake structure would be located farther upstream on the Green River; however, the water intake structure design would remain the same, as would its placement in the stream on a meander bend. Because the potential for sensitive fish species to occur in this stretch of the Green River is the same as that of Alternatives B and C, no additional or differing impacts are expected from the intake structure under Alternative D.

3.11.2.6 *Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity*

Alternatives B, C, and D involve potential short-term impacts mainly associated with construction of infrastructure. None of these impacts are expected to impact fish or macroinvertebrate habitat long term, and even short-term impacts would be reduced or negated through the use of the previously detailed BMPs. Additionally, these construction impacts are not expected to have long-term productivity impacts that go into the operations or reclamation phases. None of the impacts described above for Alternatives B, C, and D regarding surface disturbance, available habitat, entrainment and/or entrapment, or water quality would be irreversible or irretrievable based on the BMPs that would be implemented.

The water depletion associated with Alternatives B, C, and D is not expected to have a direct, physical effect on critical habitat or short-term productivity impacts to fisheries or aquatics downstream of Flaming Gorge Dam due to the relatively low volume of water withdrawal that would not impact the dam's controlled releases.

However, taking the programmatic biological opinion (USFWS 1999) and the Upper Colorado River Endangered Fish Recovery Program (2021) into account, water depletion from the Project would contribute to a cumulative depletion of the Colorado River system and would represent a direct risk to long-term productivity. This impact would be irretrievable. However, it would not be an irreversible impact to long-term sustainability of the federally listed fish species because of implementation of the following mitigation requirements outlined by the USFWS.

As part of flow requirements for the four federally listed threatened and endangered fish species in the Upper Colorado River Basin (i.e., Colorado pikeminnow, humpback chub, bonytail, and razorback sucker), water use for projects must comply with the *Recovery Implementation Program for Endangered Fish Species in the Upper Colorado Basin* (Recovery Plan) (Upper Colorado River Endangered Fish Recovery Program 2021). To ensure the survival and recovery of the four threatened and endangered fish species in the Upper Colorado River, water users with depletions are required to make a one-time payment to the Recovery Plan. In 1995, an intra-USFWS opinion determined that the fee for depletions of less than 100 acre-feet (annual average) would no longer be required, and according to correspondence from the USFWS (Reeves 2022), depletions over 4,500 acre-feet are subject to the upfront depletion payment fee. The 2023 fee for Colorado River Basin depletions is \$23.87 per acre-foot, and the 2024 fee is \$25.78 per acre-foot. The estimated annual water use for the Project (i.e., approximately 14,500 acre-feet for operations) includes all water necessary for construction and operations and would be obtained from a water intake structure on the Green River. In Wyoming, the effect determination for new and existing depletions would be completed by the Wyoming State Engineer.

The surface water use drawn from the Green River would consist of new depletions that represent a consumptive water use from the Upper Colorado River Basin of approximately 14,500 acre-feet annually. New depletions would represent an adverse effect on threatened and endangered fish species in the Upper Colorado River system. As part of the Recovery Plan for the Upper Colorado River fish species, a one-time payment would be required for the average annual depletion volume (acre-feet) that exceeds 4,500 acre-feet. The depletion fee is established each fiscal year after it has been determined that the Recovery Plan is making sufficient progress toward recovery of the endangered fish species regarding ESA compliance for water withdrawals. In addition to this upfront depletion payment fee, ongoing consultation with the USFWS may result in additional required mitigation to offset the impact of this water depletion.

3.11.2.7 Cumulative Impacts

The RFFAs in Appendix E with surface-disturbing activities that would cause sedimentation in the same drainages as this Project (in which waters flow downstream) have potential to cause cumulative impacts to water quality that could impact downstream fisheries and aquatics. Table 3.11-2 lists RFFAs and their amount of potential disturbance (in acres) to downstream fisheries. These disturbances were calculated conservatively by assuming surface disturbance at each drainage that intersects the estimated project areas of the RFFAs and does not consider whether each drainage has or does not have flowing water. Drainages that do not have flowing water would not contribute to a cumulative impact; however, the status of each drainage is not covered for the purpose of these conservative calculations and assessment of cumulative impacts. In addition, this assessment of potential surface disturbances by RFFAs does not take project-specific plans into account, including, but not limited to, the use of BMPs to prevent sedimentation to waterways or a timeline of when these RFFAs would be under construction in relation to this Project.

Table 3.11-2. Estimated Disturbance to Surface Waters in Acres from Reasonably Foreseeable Future Actions Projects

Project Name	Estimated Disturbance to Surface Waters (acres)
American Soda Solution Mining Expansion	339.35
Granger to Green River Pavement Maintenance	0.01
Green River to Buckboard Fiber Optic	0.04
I-80 MP 65 to MP 77.27 Roadway Improvements	0.03
Sweetwater Carbon Storage Hub	36.84
Project West – Fluid Transport Pipelines	0.48
Project West – Future Fluid Transport Pipelines Extensions	0.25
Project West – Rail features	0.05
Project West – Water pipeline to POD	0.61
Project West	46.58
Wilkins Peak Mountain Bike Trail Expansion	0.51
WY 374 MP 10.68, MP 15.64, MP 82.67 Structure Repair	0.02
WY 374 MP 69.77 Pavement Rehabilitation	0.62
WY 374 MP 83.67 Pavement Rehabilitation	0.49
WY 530 MP 0.80 Pavement Rehabilitation	0.16
WY 530 MP 2.40 Pavement Rehabilitation	0.85
WY374 Over Green River Structure Repair	0.11

Only RFFAs that might have a water depletion component that removes water from the Project's watersheds and reduces the overall water available for release from Flaming Gorge Reservoir could have a cumulative impact to downstream fisheries and aquatics as related to water depletion issues. Of the known RFFAs, it is likely that only Project West and the American Soda Solution Mining Expansion projects might have a water depletion component that may contribute to a cumulative impact regarding water depletion. General fluctuations or changes to annual precipitation may also cumulatively impact the amount of water available, further potentially impacting downstream fisheries and aquatics.

There are no expected cumulative impacts to fish passage, entrainment, and/or entrapment from any of the RFFAs, as none of them have proposed intake structures on perennial water bodies in the analysis area.

3.12 Wildlife Resources

The BLM coordinates activities with the WGFD and other federal agencies in managing wildlife to achieve and maintain sustainable populations. The WGFD and federal wildlife agencies are responsible for managing wildlife populations, whereas the BLM, in cooperation with state and other federal agencies, is responsible for managing wildlife habitats. A statewide agreement was established to facilitate cooperation between these agencies relative to wildlife (WGFD and BLM 1990).

This section considers impacts to the following species:

- Species listed under the ESA.

- Wyoming special status species identified by the BLM Sensitive Species Policy list (BLM 2010b).
- SGCN identified by the WGFD *State Wildlife Action Plan* (WGFD 2017a), including Greater Sage-Grouse (*Centrocercus urophasianus*) (GRSG), which are discussed separately in Section 3.13.
- Big game species (ungulates only) that are specifically managed for population target levels.
- Migratory bird species protected under the Migratory Bird Treaty Act.
- Raptor species, including bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*), which are protected under the Bald and Golden Eagle Protection Act.

The Ashley LMP lists several terrestrial wildlife species of conservation concern that are applicable to the small area of affected USFS land under Alternatives B and C. The only USFS terrestrial wildlife species of concern that may occur in this area are GRSG and pygmy rabbit (*Brachylagus idahoensis*).

The analysis area for wildlife consists of a 0.25-mile buffer around Project components, except as noted below. This analysis area is consistent with survey buffers used to conduct baseline wildlife surveys for the Project.

For big game species, the analysis area is the respective species herd unit established by the WGFD that overlaps with the Project (Figure 3.12-1). This analysis area was selected because it represents the population segment managed by the WGFD for which population size is monitored.

For all raptor species, except bald eagle, the analysis area consists of a 1-mile buffer around Project components, which is consistent with raptor surveys conducted for the Project. For bald eagle, the analysis area consists of a 2.5-mile buffer around Project components for consistency with the Kemmerer RMP (Figure 3.12-2). The analysis area for GRSG is defined by a complex GIS methodology that is described in Section 3.13.

Indicators used to evaluate the existing condition and potential impacts on wildlife species include acreage of vegetation cover types present that may be directly removed by potential surface-disturbing activities, disturbances caused by human presence, physical barriers to movement (e.g., fences), and sources of potential collisions and mortality (e.g., overhead transmission lines, roads). Potential impacts not pertaining to land cover acreages were assessed qualitatively.

3.12.1 Affected Environment

Wildlife in the Project area includes a variety of mammals, reptiles, and birds adapted to the specific habitat and climatic conditions of southwestern Wyoming's sagebrush/saltbush shrublands and semi-desert shrub-steppe. The analysis area contains a variety of vegetation communities used by wildlife to meet their life cycle requirements. Section 3.9 describes these vegetation communities in detail and includes acreages and maps of each vegetation community.

Below is a discussion of the existing conditions for wildlife resources based on a desktop analysis using publicly available datasets and the results of technical reports prepared for the Project. The 2019 Big Dry Creek Environmental Assessment described general wildlife resources in the vicinity of the Project. In 2020 and 2021, Real West and Shell Valley Consulting Associates (Shell Valley) conducted wildlife surveys for migratory birds, raptors, and targeted species listed under the ESA or identified as Wyoming BLM Sensitive Species (BLM 2010b) and WGFD SGCN (WGFD 2017a). Surveys were conducted within the mining and processing area and along the alignments for the rail line and access road, water

pipeline, natural gas pipeline, and overhead transmission line of Alternative B in 2020 (Real West 2020). The 2021 surveys were performed within an expanded footprint, or potential expansion, of the 2020 survey area (Shell Valley 2021a). In 2023, HWA Wildlife Consulting, LLC (HWA Wildlife), performed wildlife surveys for portions of Alternative D that were not previously surveyed in 2020 or 2021 (HWA Wildlife 2023). SWCA Environmental Consultants (SWCA) performed raptor nest surveys for Alternative D in May 2023 (SWCA 2023) to complete survey coverage of all Alternatives for the Project.

3.12.1.1 *Endangered Species Act Species*

The USFWS provided an official list of ESA wildlife species for the Project (Real West 2020: Addendum E). No new species occurring in Sweetwater County, Wyoming, have been added to the ESA threatened and endangered list since 2020; however, monarch butterfly (*Danaus plexippus*) has been added as a candidate species (USFWS 2020). In 2020, the USFWS identified the yellow-billed cuckoo (*Coccyzus americanus*) western distinct population segment (DPS) and four fish species endemic to the Colorado River drainage (Colorado pikeminnow, bonytail, humpback chub, and razorback sucker) as species that should be considered for an impacts analysis for the Project.

The BLM, as the lead federal action agency, has made effect determinations for the species considered in the Biological Assessment. Based on these determinations, the BLM submitted the Biological Assessment to the USFWS to initiate federal interagency formal consultation in accordance with Section 7(a)(2) of the Endangered Species Act (ESA). The BLM seeks written concurrence with its determinations of *may affect*, *likely to adversely affect* for the Colorado pikeminnow, bonytail, humpback chub, and razorback sucker based on Project-related water depletions.

The four species of Colorado River fish are addressed in Section 3.11. The yellow-billed cuckoo western DPS and monarch butterfly are addressed below.

Yellow-Billed Cuckoo Western Distinct Population Segment

The yellow-billed cuckoo western DPS is listed as threatened under the ESA. A threatened species is any species that is likely to become an endangered species within the foreseeable future throughout all or a substantial portion of its range. Critical habitat has been designated for this species; however, none has been designated in Wyoming (USFWS 2021).

The breeding habitat of the yellow-billed cuckoo western DPS consists of extensive wooded riparian areas made up of a dense shrub layer, typically willows (*Salix* spp.) and a primarily cottonwood (*Populus* spp.) overstory canopy (USFWS 2011). Suitable habitat for this species is not present in the analysis area (HWA Wildlife 2023; Real West 2020). Therefore, it is determined for all alternatives that there would be no effect to the yellow-billed cuckoo or its habitat.

Monarch Butterfly

The monarch butterfly is a candidate for listing under the ESA. Candidate species are those for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities. Candidate species do not have the same protections afforded to threatened or endangered species, and consultation with the USFWS on candidate species is not required.

The monarch butterfly is strongly associated with milkweeds (*Asclepias* spp.)—on which the species exclusively lays its eggs. Adult monarch butterflies forage on a wide variety of other flowering plants. No surveys for monarch butterflies or milkweeds were conducted in the analysis area. Crawford (2022) provides a model of predicted habitat suitability (low, medium, and high) for the State of Wyoming. In

general, Crawford (2022) determined that monarch butterfly abundance increased in habitats with high forest and herbaceous cover and decreased in areas of sagebrush cover and distance from water. The analysis area (8,769 acres) for monarch butterfly comprises the extent of all alternatives (Alternatives B, C, and D) to account for all scenarios.

3.12.1.2 Wyoming Special Status Species

Some species of wildlife are accorded special status by federal and state agencies largely because they are scarce on a regional or administrative boundary level or have clearly defined threats to long-term population sustainability within that boundary. For the purposes of this EIS, the following species designations comprise Wyoming special status wildlife species:

- **BLM-designated sensitive species, as designated by the BLM Wyoming State Director.** Sensitive species are those species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA. In addition to those species designated as sensitive by the State Director, all federal candidate species and delisted species in the 5 years following delisting are to be conserved as BLM-designated sensitive species. Sensitive species are managed as special status species, along with federally listed and proposed species, which are automatically treated as special status species.
- **Wildlife species identified by the WGFD as Species of Greatest Conservation Need.** The WGFD SGCN list includes species, excluding plants and invertebrates, identified as warranting increased management attention and consideration in conservation, land use, and development planning. Designation as a WGFD SGCN can be made from assessing known population or habitat threats, as well as a lack of sufficient information to adequately assess a species' status. Fish and aquatic species are addressed in Section 3.11.
- **USFS-designated species of conservation concern.** Species of conservation concern are those species whose long-term persistence within a national forest or grassland is of known conservation concern. The regional forester identifies species of conservation concern that are known to occur in the USFS planning area and for which "the best available scientific information indicates substantial concern about the species' capability to persist over the long term in the USFS planning area" (36 CFR 219.9[c]).

Baseline wildlife and targeted sensitive species surveys detected 21 BLM sensitive species and/or WGFD SGCN in the analysis area (Table 3.12-1). Real West (2020), Shell Valley (2021a, 2021b), and HWA Wildlife (2023) provided details on individual special status species surveys and results. Migratory birds and raptors, including eagles, some of which are BLM sensitive species and/or WGFD SGCN are discussed as separate groups below. Habitat for Wyoming special status species, collectively, consists of all LANDFIRE EVT, excluding developed, that may be used to complete life history requirements (e.g., breeding, feeding, and sheltering). Therefore, the analysis area (12,637 acres; all EVT excluding developed) may be considered potential suitable habitat for Wyoming special status species (see Section 3.9 for description of LANDFIRE EVT).

Table 3.12-1. Wyoming Special Status Wildlife Species Observed in the Analysis Area

Common Name*	Scientific Name
Birds	
Grasshopper sparrow	<i>Ammodramus savannarum</i>
Great blue heron	<i>Ardea herodias</i>
Sagebrush sparrow	<i>Artemisiospiza nevadensis</i>

Common Name*	Scientific Name
Golden eagle	<i>Aquila chrysaetos</i>
Burrowing owl	<i>Athene cunicularia</i>
Ferruginous hawk	<i>Buteo regalis</i>
Swainson's hawk	<i>Buteo swainsoni</i>
Greater sage-grouse	<i>Centrocercus urophasianus</i>
Mountain plover	<i>Charadrius montanus</i>
American kestrel	<i>Falco sparverius</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Loggerhead shrike	<i>Lanius ludovicianus</i>
Sage thrasher	<i>Oreoscoptes montanus</i>
Brewer's sparrow	<i>Spizella breweri</i>
Mammals	
White-tailed prairie dog	<i>Cynomys leucurus</i>
Pygmy rabbit	<i>Brachylagus idahoensis</i>
Reptiles	
Midget faded rattlesnake	<i>Crotalus viridis concolor</i>
Greater short-horned lizard	<i>Phrynosoma hernandesi</i>
Great Basin gophersnake	<i>Pituophis catenifer deserticola</i>
Amphibians	
Northern leopard frog	<i>Lithobates pipiens</i>
Great Basin spadefoot	<i>Spea intermontana</i>

Source: HWA Wildlife (2023); Real West (2020); Shell Valley (2021a, 2021b).

* Common and scientific names have been updated to reflect current taxonomy.

3.12.1.3 Big Game

Big game species in the Green River region are pronghorn (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), elk (*Cervus canadensis*), and moose (*Alces alces*). Big game species are managed by the WGFD by herd units unique to each species. The WGFD maps crucial ranges, exclusive of herd units, that are important to maintaining sustainable long-term population level objectives. Crucial ranges mapped for big game species can describe any seasonal range or habitat component, but often these pertain to areas important for winter survival. Other important seasonal ranges mapped by the WGFD include parturition (calving, fawning, lambing) areas and migration corridors and bottlenecks. The only big game crucial or other important ranges that overlap the Project are pronghorn crucial severe winter relief and pronghorn crucial winter/yearlong. The availability of browsing vegetation, especially sagebrush, appears to be the limiting factor for pronghorn winter range (BLM 2008a). No crucial or other important range for mule deer, elk, or moose overlaps the Project area; therefore, only pronghorn is examined using an analysis area. Pronghorn, mule deer, and moose were documented during baseline wildlife surveys for the Project (HWA Wildlife 2023; Real West 2020; Shell Valley 2021a).

Pronghorn are associated with low, rolling terrain, which supports open grassland and sagebrush communities. The analysis area for pronghorn is the herd unit. The Project is primarily within the Uinta-Cedar Mountain Herd Unit, but also includes portions of the Carter Lease and Sublette herd units. Pronghorn in the Uinta-Cedar Mountain Herd Unit are non-migratory, and Sublette Herd Unit pronghorn

are migratory. The Sublette Antelope Migration Corridor is currently identified by the state, pursuant to Wyoming's Migration Corridor Executive Order 2020-3. The migratory status of Carter Lease pronghorn is not currently known. The Uinta-Cedar Mountain Herd Unit is managed for recreational hunting. The 5-year population average for this herd unit from 2017 to 2021 was 6,321, which is below the population objective of 10,000 (WGFD 2022a). The Project has small footprints within two other pronghorn herd units, Carter Lease and Sublette; however, those footprints occur within crucial ranges, and those herd units are included in the analysis area (Appendix Q, Figure 3.12-1). The analysis area contains 43,813 acres of pronghorn severe winter relief and 2,243,952 acres of pronghorn crucial winter/yearlong range as mapped by the WGFD.

3.12.1.4 Migratory Birds

Baseline wildlife surveys in 2020, 2021, and 2023 recorded bird species common to southwestern Wyoming's sagebrush/saltbush shrublands and semi-desert shrub-steppe (Real West 2020; Shell Valley 2021a). The most common species recorded during these surveys were horned lark (*Eremophila alpestris*), sage(brush) sparrow (*Amphispiza belli [nevadensis]*), sage thrasher (*Oreoscoptes montanus*), Brewer's sparrow (*Spizella breweri*), cliff swallow (*Petrochelidon pyrrhonota*), Say's phoebe (*Sayornis saya*), mountain bluebird (*Sialia currucoides*), loggerhead shrike (*Lanius ludovicianus*), and yellow-headed blackbird (*Xanthocephalus xanthocephalus*). A list of all migratory bird species observed during baseline wildlife surveys was provided in reports from Real West (2020), Shell Valley (2021a), and HWA Wildlife (2023). Habitat for migratory birds consists of all LANDFIRE EVTs, excluding developed, that may be used to complete life history requirements (e.g., breeding, feeding, and sheltering). Therefore, the analysis area (12,637 acres; all EVTs excluding developed) may be considered potential suitable habitat for migratory birds (see Section 3.9 for description of LANDFIRE EVTs).

3.12.1.5 Raptors

Raptor species, including eagles, hawks, falcons, and owls, receive statutory protection through the Migratory Bird Treaty Act. Bald eagle and golden eagle are further protected under the Bald and Golden Eagle Protection Act. The BLM provides protection to raptors through implementation of seasonal NSO stipulations to active nests. Shell Valley (2021b) describes raptor surveys and results conducted for the Project in winter, spring, and summer of 2020 and 2021. SWCA (2023) describes raptor surveys and results conducted for Alternative D in May 2023.

Habitat in the analysis area indicates that diurnal raptor species typical of southwestern Wyoming's shrubsteppe landscape, such as golden eagle, Swainson's hawk (*Buteo swainsoni*), red-tailed hawk (*Buteo jamaicensis*), burrowing owl (*Athene cunicularia*), and ferruginous hawk (*Buteo regalis*) could be present during the nesting season. Wintering species in southwestern Wyoming would include some species found during the nesting season, as well as migrants, including rough-legged hawk (*Buteo lagopus*) and merlin (*Falco columbarius*).

Shell Valley (2021b) and SWCA (2023) reported a combined 98 probable raptor nests in the analysis area (Appendix Q, Figure 3.12-2). Eighteen nests were occupied in 2020 and 2021 (Shell Valley 2021b), and six nests were occupied by a raptor species for Alternative D in May 2023 (SWCA 2023). For all surveys combined, actively nesting species consisted of burrowing owl, bald eagle, ferruginous hawk, red-tailed hawk, osprey (*Pandion haliaetus*), prairie falcon (*Falco mexicanus*), American kestrel (*Falco sparverius*), golden eagle, and sharp-shinned hawk (*Accipiter striatus*).

Bald Eagle

The bald eagle is associated with waterbodies, including riparian corridors, with large trees suitable for nesting. This species primarily hunts fish but also scavenges on carcasses of winter- and road-killed large mammals. Typical bald eagle nesting habitat (e.g., mature cottonwood trees near water) exists within the analysis area along the Green River. However, three inactive cliff nests in the analysis area were attributed to bald eagle by Shell Valley (2021b). Two additional bald eagle nests were observed in the 2.5-mile analysis area along the Green River (BLM KFO raptor data, unpublished; Shell Valley 2021b; SWCA 2023) (Appendix Q, Figure 3.12-2).

Golden Eagle

Golden eagles inhabit diverse habitat types where large trees or cliffs provide suitable nesting substrates and open habitats provide hunting grounds. The species primarily preys on mammals ranging in size from prairie dogs to pronghorn. The entire analysis area could be considered foraging habitat for this species. Ten golden eagle nests were documented during surveys of the analysis area. None of these nests were active in 2020, but one was active in 2021 (Shell Valley 2021b), and two were active in 2023 (SWCA 2023).

3.12.2 Environmental Consequences

3.12.2.1 Analysis Method

Project scoping identified several wildlife resource issues for detailed analysis. How would construction, operations, and maintenance of the proposed Project infrastructure directly and indirectly impact species listed under the ESA? How would construction, operations, and maintenance of the proposed Project infrastructure directly and indirectly impact BLM and state-listed sensitive wildlife species? How would construction, operations, and maintenance of the proposed Project infrastructure affect migratory bird species? How would construction, operations, and maintenance of the proposed Project infrastructure affect raptor species? To determine these impacts, Project impact-causing elements were first identified. These elements consist of the following:

- Removal of existing vegetation and installation of Project infrastructure would cause loss of habitat and contribute to habitat fragmentation.
- Noise, vibration, and intermittent disruptions from mining, processing, and hauling operations and human presence would displace local wildlife species populations.
- Installation and operation of the overhead transmission line, rail line, pipelines (water and natural gas), and access roads would result in habitat fragmentation, movement barriers, and potentially increased risk for wildlife collisions and mortality.

To quantify these impacts, this analysis used the following metrics:

- Linear feet (linear features) and acres of proposed disturbance.
- Acres of potential habitat disturbed.
- Acres of mapped suitable habitat disturbed.
- Number of seasonal timing limit stipulations impacted.
- Number of raptor nests directly and indirectly disturbed (indirect impacts are associated with noise, which is defined spatially by the distance of seasonal timing limit stipulation nest buffers).

3.12.2.2 *Alternative A (No Action)*

Under the No Action Alternative, no additional expansion onto BLM- or USFS-administered lands would occur. No ground disturbance would occur, and there would be no changes or alterations to the landscape; therefore, there would be no impacts to wildlife resources. Existing conditions and trends in the analysis area would continue.

3.12.2.3 *Alternative B (Proposed Action)*

Endangered Species Act Species

No habitat is present for yellow-billed cuckoo within the analysis area, including where the water intake structure is proposed at the Green River and proposed crossings of the Blacks Fork River (HWA Wildlife 2023; Real West 2020). Therefore, no impacts to this species are expected from this alternative.

Alternative B would result in total impacts to 2,929 acres of monarch butterfly low habitat suitability, 3,377 acres of medium habitat suitability, and 14 acres of high habitat suitability. Combined, these would impact 72.0% of the analysis area for this species. These impacts would reduce the abundance of available flowering nectar plants and milkweeds that may be used by this species.

Wyoming Special Status Species

Project activities would impact available habitat for Wyoming special status species within the analysis area. Alternative B would result in the removal of up to 6,484 acres of wildlife habitat, which is approximately 51.3% of the total available wildlife habitat within the analysis area. These impacts would primarily occur within three vegetation cover types (Inter-Mountain Basins Big Sagebrush Shrubland [2,650 acres], Inter-Mountain Basins Semi-Desert Shrub-Steppe [1,328 acres], and Inter-Mountain Basins Mat Saltbush Shrubland [986 acres], which together account for 76% of the disturbed wildlife habitat in the analysis area. See Section 3.9 for detailed analysis of habitat impacts.

Special status wildlife species in the analysis area would be impacted by Project construction and operations activities, specifically, increased noise and traffic, which may result in displacement, increased mortality risk, or reduced reproductive success. The Applicant would complete preconstruction biological clearance surveys for avian and other terrestrial wildlife species resources identified as having the potential to occur in the Project area. The Applicant would coordinate the details of these surveys with the BLM, USFWS, and WGFD. If special status species are encountered during the preconstruction surveys or construction, the Applicant would implement appropriate design features or mitigation measures to avoid or minimize any anticipated effects. Design features or mitigation measures could include, but are not limited to, avoidance of specific areas during the construction process or modification of facility locations to avoid or minimize effects (Barr Engineering 2022).

Specific to mountain plover (*Charadrius montanus*), the Applicant would conduct annual nesting surveys of the license area to verify there is no nesting of this species on the site. The Applicant would avoid ground-disturbing activities within 0.25 mile of any active mountain plover nest during the seasonal stipulation (April 10–July 10) (Barr Engineering 2022).

Big Game

Alternative B would result in impacts to pronghorn through the removal of severe winter relief range for the Carter Lease (93 acres; < 0.1%) and Uinta-Cedar Mountain (1 acre; < 0.1%) Herd Units. No severe winter relief range would be removed from the Sublette Herd Unit. Alternative B would also result in impacts to pronghorn through the removal of crucial winter/yearlong range for the Carter Lease (153

acres; < 0.1%), Sublette (10 acres; < 0.1%), and Uinta-Cedar Mountain (1,686 acres; < 0.1%) Herd Units. Removal of these ranges would reduce the quantity of forage available to pronghorn during a critical time of the year thereby decreasing the number of pronghorn that those crucial ranges can support. No other big game crucial or other important range overlaps with this alternative. To reduce potential impacts, the Applicant would avoid disruptive activity in big game crucial winter range from November 15 through April 30 without prior consent from the WGFD (Barr Engineering 2022).

The 37 miles of new transportation routes and the access roads and rail lines would also potentially pose a threat to big game individuals due to the risk of collision. However, the Applicant would set speed limits for Project traffic to mitigate risk of such collisions and would adjust such speed limits should the Project result in an unacceptable level of collisions between Project vehicles and big game (Barr Engineering 2022). If speed limit adjustment does not reduce vehicle-big game collisions, the Applicant will coordinate with the BLM, WGFD, and private landowners to implement corrective actions in accordance with the Adaptive Management Wildlife Plan (Appendix K of the Mine Plan).

The Applicant would also design and build any bridges that cross over ravines or canyons to create the least amount of shadow possible to allow pronghorn to pass underneath; minimize nighttime travel and encourage employees to bus/carpool to reduce the potential for vehicle collisions with wildlife; not construct new fencing unless required by law or needed for safety reason; and design, construct, and maintain perimeter fences according to BLM standards (BLM Handbook H-1741-1) and in coordination with the WGFD. As feasible, the Applicant would incorporate wildlife-friendly perimeter fencing to control access while providing design features that benefit wildlife. Wire spacing and type would comply with BLM specifications, which would consist of a smooth lower wire and sufficient clearance to allow passage of pronghorn and metal fence posts with white tips for visibility (Barr Engineering 2022).

Migratory Birds

Alternative B would result in 6,484 acres of disturbance to native vegetation habitats used for nesting and/or foraging by migratory birds. This level of disturbance accounts for less than 51.3% of available native habitat for migratory bird species within the analysis area. These impacts would primarily occur within three vegetation cover types (Inter-Mountain Basins Big Sagebrush Shrubland [2,650 acres], Inter-Mountain Basins Semi-Desert Shrub-Steppe [1,328 acres], and Inter-Mountain Basins Mat Saltbush Shrubland [986 acres]), which together account for 76% of the disturbed migratory bird habitat in the analysis area. In addition to a reduction in available habitat for foraging and nesting, construction and operations of the Project may negatively impact functional behaviors related to breeding systems and fitness levels due to increased human activity and noise and light pollution, resulting in lower productivity and annual survival rates (Kleist et al. 2018; Ortega 2012; Price 2008).

Construction activities may result in direct mortality from destruction of active nests by construction equipment. To avoid direct mortality from construction activities, the Applicant would conduct preconstruction surveys within 7 days of any ground disturbance between April 1 and July 15. Following construction, temporary easements would be reclaimed and revegetated. Certain features of Project infrastructure, such as the natural gas pipeline and the water supply pipeline, would be sited underground, and the area on top of these elements could be reclaimed in two to three growing seasons once construction (which would take place between years 1 and 3) is complete. Together, the total disturbed area of the natural gas pipeline and water supply pipeline comprise 271 acres that would soon become re-available for migratory birds.

Waterbirds may land in the Project's evaporation ponds, potentially leading to mortality (Jehl et al. 2012). Waterbirds retrieved as part of waterfowl rehabilitation programs at other Applicant properties in southwestern Wyoming included four successful rehabilitations and five mortalities in 2021 and two

successful rehabilitations and two mortalities in 2022 (Pacific Soda 2022, 2023). The Applicant is committed to executing a hazing program for the Project to discourage waterfowl from landing and staying on the evaporation ponds. If waterbirds leave the pond for any reason, they would be retrieved and delivered to a licensed wildlife rehabilitation center for care and release.

Raptors

Baseline wildlife and raptor-specific surveys identified 84 nest structures within the analysis area (Project components plus 1-mile buffer), which indicates that the analysis area functions as hunting habitat for a range of diurnal raptor and owl species. Of the 84 nest structures, 18 nests were occupied during the survey period (nine in 2020 and 14 in 2021), and four nests were occupied in both years. None of the nests that overlap with the Alternative D analysis area were active in 2023 (SWCA 2023). Nesting species consisted of burrowing owl (four nests), ferruginous hawk (four nests), osprey (two nests on artificial platforms), prairie falcon (four nests), American kestrel (two nests), golden eagle (one nest), and sharp-shinned hawk (one nest) (Shell Valley 2021b). Alternative B is within the 0.75-mile seasonal timing limit stipulation for raptor species, excluding eagles and ferruginous hawk, for 44 nest structures. Alternative B is within the 1-mile seasonal timing limit stipulation for ferruginous hawk for 13 nest structures.

Nest abandonment may occur if construction and operations activities happen in proximity to active nests. The Applicant would conduct annual monitoring of the license area and 1-mile buffer between February and late May and would avoid ground-disturbing activities within 1 mile of any active ferruginous hawk nests or within 0.75 mile of any other active raptor species nests during the following timing stipulations: between April 15 and September 15 (for burrowing owls), between April 1 and August 31 (for northern goshawks), and between February 1 and July 31 of each year (for all other raptor species) (Barr Engineering 2022).

Bald Eagle

Three inactive cliff nests in the analysis area (Project components plus 2.5-mile buffer for bald eagle only) were attributed to bald eagle by Shell Valley (2021b); these nests were clustered along the same cliff and likely pertain to a single breeding territory. The nests were in an area approximately 0.9 mile northwest of where the water supply pipeline crosses the Blacks Fork River. These nests may be impacted through noise, disturbance, and human activities associated with construction activities, potentially resulting in abandonment of any nesting attempt. Because the water supply pipeline would be sited underground, operations of the pipeline would not result in risk of nest abandonment during the operational period of the Project. To avoid the risk of nest abandonment, the Applicant would avoid ground-disturbing activities within 1 mile of any active bald eagle nest between February 1 and July 31 of each year (Barr Engineering 2022). All three nests attributed to this species are within the 1-mile seasonal timing limit stipulation for this species.

To reduce the risk of vehicle collisions with bald eagles scavenging road-killed carcasses, the Applicant would monitor roadways for carcasses of wildlife or livestock that have collided with vehicles and remove carcasses within 24 hours of discovery, to the extent practicable. The Applicant would coordinate with the WGFD and USFWS to obtain required permits to avoid delays in carcass removal.

Golden Eagle

Ten nests in the analysis area (Project components plus 1-mile buffer), which is also the boundary for the species seasonal timing limit stipulation of 1 mile, are attributed to this species (Shell Valley 2021b; SWCA 2023). Seven of the ten nests comprise two breeding territories (four nests in one territory and three nests in the other territory), which results in up to five breeding territories in the analysis area. Only one nest was known to be active during 2020 or 2021 (Shell Valley 2021b), and two nests were active in

2023 (SWCA 2023). These nests are within the 1.0-mile seasonal timing limit stipulation for eagle nests. These nests may be impacted through noise, disturbance, and human activities associated with construction activities, potentially resulting in abandonment of any nesting attempt. To avoid the risk of nest abandonment, the Applicant would avoid ground-disturbing activities within 1 mile of any active golden eagle nest between February 1 and July 31 of each year (Barr Engineering 2022).

To reduce the risk of vehicle collisions with golden eagles scavenging road-killed carcasses, the Applicant would monitor roadways for carcasses of wildlife or livestock that have collided with vehicles and remove carcasses within 24 hours of discovery, to the extent practicable. The Applicant would coordinate with the WGFD and USFWS to obtain required permits to avoid delays in carcass removal.

3.12.2.4 *Alternative C*

Endangered Species Act Species

Impacts to the yellow-billed cuckoo western DPS and monarch butterfly would be similar in nature to those of Alternative B. No yellow-billed cuckoo western DPS habitat would be impacted by this alternative. Alternative C would impact 2,997 acres of monarch butterfly low habitat suitability, 3,374 acres of medium habitat suitability, and 14 acres of high habitat suitability, which would result in an increase of 68 acres of low habitat suitability, a decrease of 3 acres of medium habitat suitability acres, and the same number of impacted high habitat suitability acres compared to Alternative B.

Wyoming Special Status Species

The larger footprint of Alternative C would result in an additional 78 acres (6,562 acres total) of disturbance to native vegetation habitats potentially used for life history requirements of Wyoming special status species. Overall, impacts to Wyoming special status species under Alternative C would be similar in nature, but different in scope, to those described under Alternative B.

Big Game

Alternative C would remove severe winter relief range for the Carter Lease (71 acres) and Uinta-Cedar Mountain (1 acre) Herd Units. No severe winter relief range would be removed from the Sublette Herd Unit. This would be a decrease of 22 acres of severe winter relief as compared to Alternative B. Alternative C would remove crucial winter/yearlong range for the Carter Lease (153 acres), Sublette (10 acres), and Uinta-Cedar Mountain (1,718 acres) Herd Units. This would be an increase of 32 acres of crucial winter/yearlong range as compared to Alternative B. Additionally, the 39 miles of ROWs for the rail line and new access roads—2 miles more than under Alternative B—would present a greater risk to big game due to the additional collision potential presented by the additional mileage.

Migratory Birds

The larger footprint of Alternative C would result in an additional 78 acres (6,562 acres total) of disturbance to native vegetation habitats used for nesting and/or foraging by migratory birds. Overall, impacts to migratory birds under Alternative C would be similar in nature, but different in scope, to those described under Alternative B.

Raptors

Alternative C is within the 0.75-mile seasonal timing limit stipulation for raptor species, excluding eagles and ferruginous hawk, for 41 nest structures. This is a decrease by three nest structures compared to Alternative B. Alternative C is within the 1-mile seasonal timing limit stipulation for ferruginous hawk

for 15 nest structures. This is an increase by two nests as compared to Alternative B. Overall, impacts to raptors under Alternative C would be similar in nature, but different in scope, to those described under Alternative B.

Bald Eagle

All three nests attributed to this species are within the 1-mile seasonal timing limit stipulation for this species. Impacts to this species for Alternative C are the same as described for Alternative B.

Golden Eagle

Seven golden eagle nests are within the 1-mile seasonal timing limit stipulation for this species. This is a reduction by three nests as compared to Alternative B. Impacts to this species for Alternative C are the same as described for Alternative B.

3.12.2.5 *Alternative D (Preferred Alternative)*

Endangered Species Act Species

Impacts to the yellow-billed cuckoo western DPS and monarch butterfly would be similar in nature to those of Alternative B. No yellow-billed cuckoo western DPS habitat would be impacted by this alternative. Alternative D would impact 3,082 acres of monarch butterfly low habitat suitability and 3,930 acres of medium habitat suitability, which would result in an increase of 153 acres of low habitat suitability and an increase of 553 acres of medium habitat suitability. No high habitat suitability would be impacted, which would result in a decrease of 14 acres of high habitat suitability compared to Alternative B.

Wyoming Special Status Species

The larger footprint of Alternative D would result in an additional 1,065 acres (7,583 acres total) of disturbance to native vegetation habitats potentially used for life history requirements of Wyoming special status species. Overall, impacts to Wyoming special status species under Alternative D would be similar in nature, but different in scope, to those described under Alternative B.

Big Game

Alternative D would remove no severe winter relief range within the analysis area. This would be a decrease of 94 acres of severe winter relief as compared to Alternative B. No crucial winter/yearlong range would be removed in the Carter Lease Herd Unit because of Alternative D. In total, this would be an increase of 1,517 acres of crucial winter/yearlong range as compared to Alternative B. Additionally, there would be 19 miles of ROWs for the new access roads under Alternative D (18 fewer miles than under Alternative B), which would present a risk to big game due to the potential for vehicle-big game collisions.

Migratory Birds

The larger footprint of Alternative D would result in an additional 1,065 acres (7,583 acres total) of disturbance to native vegetation habitats used for nesting and/or foraging by migratory birds. Overall, impacts to migratory birds under Alternative D would be similar in nature, but different in scope, to those described under Alternative B.

Raptors

Alternative D is within the 0.75-mile seasonal timing limit stipulation for raptor species, excluding eagles and ferruginous hawk, for 26 nest structures. This is a decrease of 18 nest structures compared to Alternative B. Alternative D is within the 1-mile seasonal timing limit stipulation for ferruginous hawk for five nest structures. This is a decrease by eight nests as compared to Alternative B. Overall, impacts to raptors under Alternative D would be similar in nature, but different in scope, to those described under the Alternative B.

Bald Eagle

One bald eagle nest is within the 1-mile seasonal timing limit stipulation for this species under Alternative D. This is a decrease of two nests (but an equal number of territories) compared to Alternative B.

Golden Eagle

Ten golden eagle nests are within the 1-mile seasonal timing limit stipulation under Alternative D. This is the same number as compared to Alternative B. Impacts to this species for Alternative D would be the same as described for Alternative B.

3.12.2.6 *Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity*

Removal of wildlife habitat associated with all action alternatives would be irretrievable until reclamation and revegetation occurs. As stated in Section 3.9, impacts from invasive species due to surface disturbance and subsequent spread would likely result in long-term declines of vegetation productivity and degradation of EVTs, resulting in long-term declines of productive wildlife habitat. Reclamation efforts may lead to the reestablishment of native vegetation and EVTs but the quality of the habitat could be permanently degraded, which could cause irreversible impacts to wildlife habitat in the analysis area. Other potential irreversible impacts could occur where construction, operations, and decommissioning activities permanently change vegetation composition and the structure of EVTs due to unsuccessful reclamation efforts. Given the impacts of the project and the difficulties associated with reclamation, the potential exists for short- and long-term impacts to vegetation productivity and wildlife population sustainability in the analysis area.

3.12.2.7 *Cumulative Impacts*

RFFAs with a potential to impact vegetation and, consequently, wildlife habitat include all actions that would remove habitat through surface-disturbing activities, including the approximately 3,722-acre Project West and the approximately 35,668-acre American Soda Solution Mining Expansion (Appendix E). Other RFFAs would have negligible impacts to vegetation, including the WYDOT roadway improvements and structure repairs, Skyline ADA Trail, Wilkins Peak Mountain Bike Trail Expansion, and a paleontological excavation. The total amount of estimated disturbance associated with the RFFAs (Appendix E) is approximately 43,603 acres, although the actual amount of disturbance to vegetation is not known at this time. The total potential vegetation disturbance from the Proposed Action (6,484 acres) and the RFFAs would be approximately 50,087 acres. This disturbance would primarily occur in Inter-Mountain Basins Big Sagebrush Shrublands, Inter-Mountain Basins Semi-Desert Shrub-Steppe, and Inter-Mountain Basins Mat Saltbush Shrubland EVTs. Wildlife species commonly associated with those EVTs could be cumulatively impacted by these projects.

3.13 Greater Sage-Grouse

3.13.1 Affected Environment

GRSG is a species for which there has been a great deal of concern in recent years. This concern has led to the development of specific guidance for analysis and avoidance of impacts on the species. As such, this section includes a greater level of detail than is included for other species.

GRSG is a known obligate of sagebrush habitats, meaning it requires sagebrush for some part of its life cycle. The GRSG is the largest North American grouse species. Males are larger than females; males are 1.7 to 2.9 kilograms (kg) and 65 to 75 centimeters (cm) long, whereas females are 1.0 to 1.8 kg and 50 to 60 cm long (WGFD 2017g).

The center of breeding activity for the GRSG is referred to as a strutting ground or lek. Leks are characterized as flat, sparsely vegetated areas within large tracts of sagebrush (Connelly et al. 2004). Males begin to appear on leks in March, with peak attendance in Wyoming leks occurring in April (WGFD 2003). Nesting generally commences 1 to 2 weeks after mating and extends until mid-June (BLM 2015). GRSG nesting habitat typically is centered around active leks and consists of medium to tall sagebrush with a perennial grass understory (Connelly et al. 2000). Research suggests that approximately 80% of GRSG nests are within 4 miles of the lek where breeding occurs (Colorado Greater Sage-grouse Steering Committee 2008; Holloran and Anderson 2005; Moynahan 2004). Studies have shown that taller sagebrush with larger canopies and more residual understory cover usually leads to higher nesting success for this species (Connelly et al. 2000, 2004).

During late spring and summer, hens and broods are typically found in more lush habitats with a high diversity of grasses and forbs that attract insects. These habitats include wet meadows, riparian areas, and irrigated farmland within or near sagebrush. Hens with broods use these habitats until forbs desiccate and insect abundance decreases. Unsuccessful hens and cocks also would use these same habitats; however, due to their nutritional flexibility, they are able to occupy a wider variety of habitats during the spring and summer months (Connelly et al. 2004). In many GRSG populations, limited availability of high-quality brood-rearing habitat often negatively impacts recruitment. Factors affecting the availability of brood-rearing habitat include drought, nonnative grass and weed invasions, overgrazing associated with historical improper range management strategies (Klebenow 1982, 1985; Oakleaf 1971), and sagebrush removal.

Depending on the severity of the winter, GRSG move to south- and west-facing slopes that maintain exposed sagebrush. Windswept ridges, draws, and swales may also be used, especially if these areas are in proximity to exposed sagebrush (Connelly et al. 2004). In years with severe winter conditions (i.e., deep snow), GRSG often gather in large flocks in areas with the highest quality winter habitat. It is suggested that high-quality winter habitat is limited in portions of the GRSG's range (Connelly et al. 2000).

Major threats to GRSG or GRSG habitat on BLM-administered lands in the Wyoming subregion consist of the following (BLM 2015):

- Oil and gas development
- Hard rock mining
- Infrastructure
- Invasive species

- Wildfire
- Conifer invasion
- Loss of habitat components due to improper livestock grazing techniques
- Human uses

In 2010, the USFWS declared that GRSG warrant protection as an endangered species under the ESA; however, listing was precluded by the need to take action on other species facing more immediate and severe extinction threats. In 2015, the USFWS found that listing the GRSG under the ESA was not warranted, because the primary threats to the species had been ameliorated with conservation efforts on federal, state, and private lands (BLM 2021a). These efforts included BLM and USFS land use plans for conserving, enhancing, and restoring sagebrush ecosystems across the West.

3.13.1.1 Federal Greater Sage-Grouse Management

Bureau of Land Management

In Wyoming, the BLM currently manages GRSG according to the 2015 ARMPA. The 2015 ARMPA is built upon the foundation for GRSG management established by and complementary to the Governor's EO 2011-05 (superseded by EO 2019-3), Greater Sage-Grouse Core Area Strategy, by establishing similar conservation measures and focusing restoration efforts in the following key areas that are most valuable to GRSG (BLM 2015).

Habitat management areas (HMAs) – On BLM-administered lands covered by the 2015 ARMPA (BLM 2015), HMAs are characterized as priority habitat management areas (PHMAs) and general habitat management areas (GHMAs). PHMAs are areas that have the highest conservation value to maintaining or increasing GRSG populations. These areas would include breeding, late brood-rearing, winter concentration areas, and known, migration, or connectivity corridors (BLM 2015). PHMAs also include Sagebrush Focal Areas (SFAs), which are a subset of PHMAs derived from GRSG stronghold areas. SFAs have high densities of GRSG and include other important criteria important for the success of the species. GHMAs are occupied (seasonal or year-round) habitat outside of PHMAs (BLM 2015). The State of Wyoming manages GRSG through Core Population Areas (Core Areas), which, when combined with Connectivity Areas and Winter Conservation Areas, represent approximately 83% of the GRSG population (EO 2019-3). For the purposes of this EIS, it is assumed that Core Areas and PHMAs encompass the same habitat, and Non-Core Areas and GHMAs encompass the same habitat. HMA data used in this analysis are recent to 2019 and are consistent with the regulations described in the 2015 ARMPA (BLM 2015).

Leks – The 2015 ARMPA (BLM 2015) has specific regulations for leks depending on their defined status, which include the following:

- Occupied lek – A lek that has been active during at least one strutting season in the prior 10 years. Occupied leks are protected through prescribed management actions during surface-disturbing activities.
- Unoccupied lek – There are two types of unoccupied leks: destroyed and abandoned. Unoccupied leks are not protected during surface-disturbing activities. Abandoned leks are leks in otherwise suitable habitat that have not been active during a period of 10 consecutive years.

Surface occupancy – The 2015 ARMPA (BLM 2015) lays out specific regulations that prohibit surface occupancy near occupied leks. Surface occupancy is defined as “placement or construction on the land surface of semi-permanent or permanent facilities requiring continual service or maintenance. Casual use

is not included” (BLM 2015). MD Special Status Species (SSS) 5 and MD SSS 6 of the 2015 ARMPA (BLM 2015) define surface occupancy restrictions. Per MD SSS 5, for all leks within PHMAs, surface occupancy and surface-disturbing activities are prohibited on or within a 0.6-mile radius of occupied GRSG leks. Per MD SSS 6, for all leks outside PHMAs, surface occupancy and surface-disturbing activities are prohibited on or within a 0.25-mile radius of occupied GRSG leks. However, a BLM Authorized Official may grant an exception if an environmental record of review determines that the action, as proposed or conditioned, would not impair the function or utility of the site for the current or subsequent seasonal habitat, life history, or behavioral needs of GRSG (BLM 2015).

Seasonal restrictions – The 2015 ARMPA (BLM 2015) also requires seasonal restrictions to protect GRSG during potentially vulnerable periods of the species’ life history from surface disturbing and/or disruptive activities. MD SSS 7 through 10 define seasonal restrictions for GRSG in the planning area; however, only MD SSS 7 and MD SSS 9 apply to the ARMPA planning area. Both MD SSS 7 and 9 require restrictions during the GRSG breeding, nesting, and early brood-rearing season, which spans from March 15 to June 30. Under MD SSS 7, the breeding, nesting, and early brood-rearing seasonal restriction applies to all PHMAs. Under MD SSS 9, the breeding, nesting, and early brood-rearing seasonal restriction applies to all lands within 2 miles of the lek or lek perimeter of any occupied lek outside PHMAs (BLM 2015).

Noise restrictions – GRSG are protected from noise pollution. MD SSS 12 of the 2015 ARMPA states “new project noise levels, either individual or cumulative, should not exceed 10 A-weighted decibels (dBA) (as measured by L50) above baseline noise at the perimeter of the lek from 6:00 pm to 8:00 am during the breeding season (March 1–May 15)” (BLM 2015).

U.S. Forest Service

In Wyoming, the USFS manages GRSG according to the USFS *Greater Sage-Grouse Record of Decision for Idaho and Southwest Montana, Nevada, and Utah* (USFS 2015). This addresses the preservation of GRSG habitat within specified areas of the Ashley National Forest in Wyoming. This plan also uses categories of HMAs for addressing specific conservation needs. Similar to the 2015 ARMPA (BLM 2015), this plan also uses PHMA and GHMA definitions for determining GRSG regulations. Attachment D, *Greater Sage-Grouse Wyoming Plan Amendment for Portions of the Ashley and Uinta-Wasatch-Cache National Forests that Occur in Wyoming*, specifically outlines the timing, distance, density, and disturbance (TDDD) regulatory guidelines for GRSG management.

Surface occupancy (GRSG-TDDD-ST-012-Standard, GRSG-TDDD-ST-013-Standard) and seasonal restrictions (GRSG-TDDD-GL-016-Guideline, GRSG-TDDD-GL-018-Guideline) follow the same guidelines as the 2015 ARMPA (BLM 2015). Noise restrictions slightly differ in that noise levels 10dBA above ambient are not to be exceeded at the perimeter of an occupied lek from March 1 to April 30 from 6:00 p.m. to 9:00 a.m.

3.13.1.2 State of Wyoming Greater Sage-Grouse Management

EO 2019-3, issued by the Governor of Wyoming, replaces previous EOs 2015-4 and 2017-2 and addresses the protection of GRSG core areas within the state by establishing a GRSG Core Area Strategy. The order emphasizes the importance of conserving and preserving critical habitats for the GRSG, a SGCN. It establishes measures to mitigate the impact of development activities within the Core Areas while ensuring responsible and sustainable resource management. The order aims to balance the protection of GRSG habitat with the state’s economic interests, promoting collaboration between various stakeholders to achieve these goals. By implementing this EO, Wyoming seeks to maintain ecological balance while supporting its natural resources and industries. EO 2019-3 also establishes a Density and

Disturbance Calculation Tool (DDCT) to evaluate proposed disturbance within core and connectivity PHMAs. EO 2019-3 also requires on-site and off-site mitigation. Pacific Soda would be required to submit any segments of the Project footprint situated within GRSG PHMAs (Core Areas) to the WGFD's DDCT. Furthermore, Pacific Soda is obligated to fully comply with EO 2019-3 or the most current policy. EO 2019-3 mandates compensation for GRSG impacts in cases where impacts cannot be avoided or minimized.

3.13.1.3 Analysis Area

The analysis area was established consistent with the State of Wyoming's primary strategy to conserve GRSG and its habitat as set forth in EO 2019-3, which establishes the DDCT to evaluate proposed disturbance within PHMAs and GHMAs. The DDCT analysis area is clipped to Core Areas only, whereas the analysis area for this EIS is inclusive of Core and Non-Core Areas, so that impacts to GHMAs (Non-Core Areas) can also be evaluated. The analysis area is defined by the following:

- Merge all EIS alternatives (Alternatives B, C, and D) together into one layer to account for all scenarios (Project area).
- Buffer the Project area by 4 miles. A 4-mile buffer was chosen to account for multiple indirect impacts to GRSG that could result from disturbances due to low structures, linear features, surface disturbances, and tall structures that would be caused by Project infrastructure and mining activities (Gibson et al. 2018; Manier et al. 2014).
- Use the extent of all HUC-12 subwatershed boundaries that capture all lands that surround the 4-mile Project area buffer.
- The spatial extent of the GRSG analysis area is defined by all lands within the greater HUC-12 boundary (Appendix Q, Figure 3.13-1).

The analysis area encompasses 922,772 acres. The analysis area includes portions of the Blacks Fork, Greater South Pass, Seedskadee, and Uinta PHMAs, which comprise 334,958 acres (approximately 36.3% of the analysis area). There are no SFAs within the analysis area. An additional 587,815 acres (63.7%) of the analysis area contains GHMAs (Table 3.13-1). There are 30 occupied leks in the analysis area, and 12 of these occupied leks are within 4 miles of the edge of the Project area (Table 3.13-2). GRSG were observed during surveys of the analysis area in 2020 and 2021 (Real West 2020; Shell Valley 2021).

Table 3.13-1. Habitat Management Areas within the Greater Sage-Grouse Analysis Area

HMA Designation	Acres in Analysis Area	Percentage of Analysis Area
Blacks Fork PHMA	153,986.3	16.7%
Greater South Pass PHMA	103,264.9	11.2%
Seedskadee PHMA	17,321.1	1.9%
Uinta PHMA	60,385.4	6.5%
PHMA total	334,957.7	36.3%
GHMA	587,814.5	63.7%
HMA total	922,772.2	100.0%

Table 3.13-2. Occupied Leks within the Greater Sage-Grouse Analysis Area

Lek Name	Core Area	PHMA or GHMA	Land Status of Lek	Distance to Alternative B (acres)	Distance to Alternative C (acres)	Distance to Alternative D (acres)
Lost Dog/Highway 530*	Blacks Fork	PHMA	BLM	0.37	0.37	8.95
North Halfway Hollow*	Blacks Fork	PHMA	Private	0.81	0.81	0.81
Little Dry Creek*	Blacks Fork	PHMA	BLM	1.53	1.53	2.03
Massacre Hill*	Blacks Fork	PHMA	BLM	2.16	2.16	6.44
East Peru*	All Non-Core	GHMA	BLM	2.21	2.21	6.33
Lost Dog 4*	Blacks Fork	PHMA	Private	2.84	2.84	5.41
Solvay 2*	Blacks Fork	PHMA	BLM	3.24	5.06	3.42
Little America 6*	All Non-Core	GHMA	BLM	3.25	1.65	5.82
North Buckboard*	Blacks Fork	PHMA	Private	3.59	3.59	3.59
Peru*	All Non-Core	GHMA	BLM	3.99	3.99	4.54
Lost Dog 2	Blacks Fork	PHMA	Private	4.31	4.31	6.28
Seven Mile Gulch 1	Seedskaadee	PHMA	BLM	4.39	4.39	14.07
Meadow Sp 3	Uinta	PHMA	BLM	5.12	5.12	8.16
Blacks Fork 2	Blacks Fork	PHMA	Private	5.61	5.61	4.92
Blacks Fork 1*	Blacks Fork	PHMA	BLM	6.41	6.41	3.89
Big Island 2	All Non-Core	GHMA	Private	6.56	6.56	5.17
Bryan 1*	All Non-Core	GHMA	BLM	7.08	7.08	1.30
Sage Creek - GR	Blacks Fork	PHMA	Private	7.53	7.53	7.53
Lewis Gravel	All Non-Core	GHMA	Private	7.75	7.75	4.53
Meadow Sp 2	Uinta	PHMA	Private	7.79	6.47	10.79
Brees Hill	Blacks Fork	PHMA	State	8.24	8.24	8.24
Pando	All Non-Core	GHMA	BLM	8.54	5.87	15.32
FMC Granger	All Non-Core	GHMA	Private	8.70	8.70	14.33
Kerr	Greater South Pass	PHMA	BLM	9.71	9.71	4.08
Greasewood Canyon	Greater South Pass	PHMA	Private	9.87	9.87	5.28
Meadow Sp 1	All Non-Core	GHMA	Private	10.19	9.42	11.93
Pilot Butte	Greater South Pass	PHMA	BLM	11.99	11.99	9.00
Zieglers Wash North	All Non-Core	GHMA	Private	13.76	13.76	24.27
Roberson East	All Non-Core	GHMA	Private	16.09	16.09	26.70
Alkali Creek 4	Greater South Pass	PHMA	BLM	20.18	20.18	14.33

* Leks that are within 4 miles of one of the Project alternatives.

3.13.2 Environmental Consequences

3.13.2.1 Analysis Method

Project scoping identified one primary GRSG issue for detailed analysis: How would the construction, operations, and maintenance of the proposed Project infrastructure impact GRSG and its habitat? To determine these impacts, Project impact-causing elements were first determined. Project impact-causing elements are discussed in detail below (Alternative B). These Project impact-causing elements include the following:

- The duration (in estimated years) of surface disturbance that would result in the removal of existing vegetation and/or soil that would cause loss of habitat and contribute to habitat fragmentation.
- Operation of the overhead transmission line, rail line, and access roads that would result in increased risk for GRSG collisions.
- Degraded and/or avoided habitat due to surface disturbance, linear features, processing, hauling, and increased human presence due to mining operations, access roads, rail lines, and overhead transmission lines. Degraded habitat is associated with increased habitat avoidance, increased avian predation, and increased invasive weeds presence.

To provide a quantitative and qualitative analysis of Project impact-causing elements on GRSG, Project impacts are described by indicators of direct and indirect impacts to GRSG.

Indicators of direct impacts to GRSG consist of the following:

- Acres of PHMAs and GHMAs disturbed due to direct impacts. Specifically, where impacts span either of two time frames—27 to 77 years for construction impacts or 52 to 110 years for operations impacts and result in the loss of habitat from construction and Project operations/infrastructure.
- Qualitative assessment of GRSG mortality caused by construction and operations of the Project, where the degree of potential mortality is assumed to be proportional to the amount of construction and operations impacts.
- Leks situated within PHMA that are within 0.6 mile of the Project area.
- Leks situated within GHMAs that are within 0.25 mile of the Project area.
- Acres of the Project footprint subject to the 0.6 mile surface occupancy/surface disturbance lek buffer (leks inside PHMAs). Acres of the Project footprint subject to the 0.25-mile surface occupancy/surface disturbance lek buffer (leks outside PHMAs).

Indicators of indirect impacts to GRSG consist of the following:

- Acres of degraded habitat due to low structures, linear features, and tall structures and surface disturbance due to Project infrastructure and mining activities as determined by the 4-mile buffer around the Project area.
- All leks within 4 miles of the Project area.
- All leks that are predicted to experience noise pollution that would exceed 10 dBA above ambient levels.

This analysis also discloses the extent of the Project area that would be subject to seasonal restrictions, including acres of PHMAs and GHMAs that would be subject to the March 15 to June 30 seasonal restriction.

3.13.2.2 *Alternative A (No Action)*

Under the No Action Alternative, no additional expansion onto BLM- or USFS-administered lands would occur. No ground disturbance would occur, and there would be no changes or alterations to the landscape; therefore, there would be no impacts to GRSG. Existing conditions and trends in the analysis area would continue.

3.13.2.3 *Alternative B (Proposed Action)*

Direct impacts on GRSG include mortality, which would result from collisions with access vehicles on access roads, construction equipment, and mining machinery; the direct loss of designated HMAs; and mortality of any GRSG within construction sites. Habitat loss would be attributed to vegetation and soil removal associated with surface disturbance caused by construction and the installation of mining infrastructure. Direct impacts stemming from construction disturbance in the habitat, as well as the associated habitat fragmentation, would be confined to the time frame during which construction and mining activities occur, as well as the subsequent period needed for reclamation. It is crucial to note that certain woody vegetation types, particularly sagebrush, may necessitate 25 to 75 years for successful recovery to take place (Nelson et al. 2013). Consequently, the construction and operation of the mine and its associated infrastructure would result in variable duration impacts.

Impacts associated with the construction of the water supply pipeline, transmission line, rail line, and natural gas pipelines would be expected to span 27 to 77 years. This is because infrastructure construction could potentially take up to 2 years. Thus, this analysis assumes that reclamation would occur once construction is complete. Therefore, it is estimated that these shorter-duration impacts to GRSG HMAs would last from 27 to 77 years, assuming the successful reestablishment of sagebrush equates to habitat recovery. In total, 153.4 acres of PHMA, 392.9 acres of GHMA, and 546.3 acres of total HMA would experience 27 to 77 years of impacts. Acres affected by 27 to 77 year impacts, categorized by the factors that would cause disturbance, are listed in Table 3.13-3. The relative locations where these impacts would occur within GRSG habitat are shown on Figure 3.13-2 (Appendix Q).

Table 3.13-3. Alternative B Construction (27 to 77 years) and Operations (52 to 110 years) Direct Impacts to Greater Sage-Grouse Habitat

Disturbance Causing Factor	Acres of PHMA Disturbed (percentage of PHMA in analysis area)	Acres of GHMA Disturbed (percentage of GHMA in analysis area)	Total Acres (percentage of total habitat in analysis area)
Construction Impacts			
Rail line easement	4.7 (< 0.1%)	64.7 (< 0.1%)	69.4 (< 0.1%)
Water supply pipeline easement	42.0 (< 0.1%)	25.8 (< 0.1%)	67.8 (< 0.1%)
Water supply pipeline ROW	106.7 (< 0.1%)	72.6 (< 0.1%)	179.3 (< 0.1%)
Natural gas pipeline ROW	0.0 (0.0%)	24.2 (< 0.1%)	24.2 (< 0.1%)
Transmission line ROW	0.0 (0.0%)	205.6 (< 0.1%)	205.6 (< 0.1%)
Construction Impacts Total	153.4 (< 0.1%)	392.9 (0.1%)	546.3 (0.1%)
Operations Impacts			
Project area	0.0 (0.0%)	4,980.8 (0.8%)	4,980.8 (0.5%)

Disturbance Causing Factor	Acres of PHMA Disturbed (percentage of PHMA in analysis area)	Acres of GHMA Disturbed (percentage of GHMA in analysis area)	Total Acres (percentage of total habitat in analysis area)
Rail line and siding ROW	156.9 (< 0.1%)	796.6 (0.1%)	953.3 (0.1%)
Mine site access road ROW	13.5 (< 0.1%)	45.2 (< 0.1%)	58.6 (< 0.1%)
Operations Impacts Total	170.4 (0.1%)	5,822.6 (1.0%)	5,992.7 (0.6%)

Impacts on GRSG habitat resulting from mine operations would be caused by mining operations within the Project area, the rail line and siding ROW, and the mine site access road. Reclamation for operations within the Project area would be staggered and commence once each mining phase is complete. The earliest estimated completion of reclamation for phases 1, 2, and 3 is 19 years, 24 years, and 27 years, respectively, from the Project's commencement. Therefore, it is reasonable to estimate that GRSG habitat restoration would not be achieved until 52 to 102 years after the conclusion of mining operations. Remaining Project infrastructure, such as mine processing facilities within the Project area, the mine site access road, and the rail line and siding ROW, would not have reclamation work started until 35 years after the Project's commencement. Consequently, in these areas, GRSG habitat restoration would not be achieved for 60 to 110 years after the Project's commencement. In total, 170.4 acres of PHMA, 5,822.6 acres of GHMA, and 5,992.7 acres of total HMA would experience these operations (52 to 110 years) impacts. The acres affected by these impacts, categorized by the factors causing disturbance, are detailed in Table 3.13-3. The relative locations of these impacts within GRSG habitat are illustrated on Figure 3.13-2 (Appendix Q).

It is assumed, for the context of this analysis, that Pacific Soda's reclamation efforts targeting GRSG habitat would be successful. Nevertheless, it is crucial to acknowledge the potential challenges associated with the reclamation process, particularly in dealing with pre-existing invasive plants, notably cheatgrass. This challenge may persist before, during, and after the reclamation activities, as outlined in Section 3.9. Consequently, the extent of degradation caused by invasive plants within GRSG habitat hinges on the effectiveness of the reclamation work, necessitating guidance from the Noxious and Invasive Weed Management Plan (Appendix G of the Mine Plan). Table 3.13-4 lists the leks that are within 4 miles of the Project footprint.

Table 3.13-4. Leks within 4 Miles of Alternative B

Lek Name	Core Area	HMA Designation	Land Status	Distance to Project Area (miles)
East Peru	All Non-Core	GHMA	BLM	2.21
Little America 6	All Non-Core	GHMA	BLM	3.24
Little Dry Creek	Blacks Fork	PHMA	BLM	1.53
Lost Dog 4	Blacks Fork	PHMA	Private	2.84
Lost Dog/Highway 530*	Blacks Fork	PHMA	BLM	0.37
Massacre Hill	Blacks Fork	PHMA	BLM	2.16
North Buckboard	Blacks Fork	PHMA	Private	3.59
North Halfway Hollow	Blacks Fork	PHMA	Private	0.81
Peru	All Non-Core	GHMA	BLM	3.99
Solvay 2	Blacks Fork	PHMA	BLM	3.24

* Leks that require NSO stipulations.

Indirect impacts on GRSG resulting from Alternative B would arise from Project infrastructure and mining activities. The elements contributing to these indirect impacts encompass low structures (such as fences), surface disturbance (linked to mining activities, road construction, rail line construction, and water and natural gas pipeline construction), resulting use of linear features (access road and the rail line), and resulting tall structures (transmission lines). Low structures, such as fences or small buildings, can lead to increased mortality due to collisions. Moreover, they can induce aversion behavior in historical GRSG populations; this effect is believed to extend up to 1.2 miles from the source (Manier et al. 2014). Surface-disturbing activities associated with mining, including the construction of mining and processing facilities, roads, and pipelines, collectively create a human footprint that can remove or alter the natural vegetation community at a site. This alteration can have detrimental effects on local GRSG populations, including habitat loss, habitat fragmentation, GRSG aversion to the site of disturbance and its surrounding habitat, decreased nesting rates, decreased nest success, and decreased lek attendance. The effect of these surface-disturbing activities is estimated to extend at least 3.1 miles from the source (Manier et al. 2014). The duration of these impacts would depend on the timeline of construction activities. Impacts associated with linear features, such as roads, rail lines, and pipelines, can have similar effects as surface disturbances, and the effect of these impacts are also believed to extend at least 3.1 miles from the source.

Tall structures, such as transmission lines, can have negative indirect impacts on GRSG, which extend far beyond the Project footprint. These impacts include habitat avoidance, avian predation, and lower rates of recruitment (Gibson et al. 2018; Gillan et al. 2013; Kohl et al. 2019; Manier et al. 2014). Gibson et al. (2018) found that the effects of transmission lines on GRSG extend out at least 6.21 miles (10 km) from transmission lines, but the effects were contingent on local raven (corvid) abundance and predatory behavior (i.e., ravens are GRSG nest predators). Manier et al. (2014) suggested that tall structures may result in increased opportunities for predator use, especially by corvids, leading to increased GRSG predation and mortality. Manier et al. (2014) estimated that GRSG aversion behavior to tall structures extends out at least 2.0 miles. Overall, the 4.0-mile buffer serves as an estimate for all potential indirect impacts on GRSG from the Project. It is important to note that indirect impacts within this 4-mile buffer are not equal, and that the degree (i.e., effect size) of the impact decreases with distance from the impact-causing element. Additionally, previous studies have demonstrated that when linear features, such as overhead transmission lines or roads, are situated within or parallel to pre-existing infrastructure (i.e., they run parallel to pre-existing lines), there is less novel habitat degradation and a smaller effect on habitat avoidance compared to lines situated in previously undisturbed habitat (Hansen et al. 2016). However, this study was only conducted over a 2-year period, and Hansen et al. (2016) cautioned that increases in habitat avoidance may become more apparent over longer periods.

In total, Alternative B would result in 117,796.8 acres of indirect impacts to PHMAs and 202,599 acres of impacts to GHMAs, totaling 320,395 acres of impacts to GRSG HMAs. Approximately 11.1 miles of the water supply pipeline ROW parallels WY 530. The habitat along this parallel section would not experience novel impacts from Alternative B. However, construction and operations of the water supply pipeline ROW would likely further contribute to the impacts associated with WY 530. Indirect impacts from the water supply pipeline that do not parallel WY 530 would only span 2 years, as would the indirect impacts from the construction of the natural gas pipeline. Indirect impacts resulting from the remaining constructed infrastructure and pre-existing infrastructure, which would experience increased use (such as the existing access road and WY 530), would likely persist for 30 years.

There are 10 occupied leks within 4 miles of Alternative B (Table 3.13-4). Nine of these leks would be subject to indirect impacts associated with low structures, linear features, and surface disturbance. The Solvay 2 Lek (the 10th lek) would also experience indirect impacts associated with increased avian predation due to its proximity to the transmission line. The North Halfway Hollow Lek and the North Buckboard Lek are 0.8 mile and 3.6 miles, respectively, from the existing access road ROW. These leks

would not experience novel disturbances from the Project, but they would experience increased impacts associated with increased traffic, making them less viable in the long term.

Under Alternative B, five leks would experience noise pollution of 10 dBA above ambient due to construction and/or operations activities: Lost Dog/Highway 530 Lek, North Halfway Hollow Lek, Little Dy Creek Lek, Massacre Hill Lek, and East Peru Lek (Appendix H). The Project would need to limit noise pollution from 6 p.m. to 8 a.m. to keep noise levels below the 10 dBA above ambient threshold at these leks.

Under Alternative B, 324.0 acres of PHMA would be subject to seasonal restrictions. This comprises 148.7 acres of water supply pipeline area in the Blacks Fork Core Area, 13.7 acres of the mine site access road area in the Uinta Core Area, 161.7 acres of the rail line and siding permanent ROW in the Uinta Core Area, and 4.7 acres of the rail line temporary easement in the Uinta Core Area.

3.13.2.4 Alternative C

Acres directly affected by construction impacts (22–77 years), categorized by the factors causing disturbance, are provided in Table 3.13-5. The relative locations where construction impacts would occur within GRSG habitat are shown on Figure 3.13-3 (Appendix Q). Alternative C's construction and operations impacts to GRSG habitat would be similar to those discussed under Alternative B but would vary in intensity. Overall, Alternative C would result in 598.9 acres of construction impacts to all HMAs. More specifically, it would result in 185.1 acres of construction impacts to PHMAs, which is more than Alternative B, and 413.8 acres of construction impacts to GHMAs (Table 3.13-5), which is also more than Alternative B.

Table 3.13-5. Alternative C Construction (27–77 years) and Operations (52–110 years) Direct Impacts to Greater Sage-Grouse Habitat

Disturbance-Causing Factor	Acres of PHMA Disturbed (percentage of PHMA in analysis area)	Acres of GHMA Disturbed (percentage of GHMA in analysis area)	Total Acres (percentage of total habitat in analysis area)
Construction Impacts			
Water supply pipeline easement	42.0 (< 0.1%)	25.8 (< 0.1%)	67.8 (< 0.1%)
Water supply pipeline ROW	106.7 (< 0.1%)	72.6 (< 0.1%)	179.3 (< 0.1%)
Rail line easement	4.7 (< 0.1%)	42.4 (< 0.1%)	47.1 (< 0.1%)
Natural gas pipeline ROW	0.0 (0.0%)	24.2 (< 0.1%)	24.2 (< 0.1%)
Transmission line ROW	31.7 (< 0.1%)	248.8 (< 0.1%)	280.5 (< 0.1%)
Construction Impacts Total	185.1 (0.1%)	413.8 (0.1%)	598.9 (0.1%)
Operations Impacts			
Project area	0 (0%)	4,980.8 (0.8%)	4,980.8 (0.5%)
Rail line and siding ROW	156.9 (< 0.1%)	796.4 (0.1%)	953.3 (0.1%)
Mine site access road ROW	13.5 (< 0.1%)	53.9 (< 0.1%)	67.4 (< 0.1%)
Operations Impacts Total	170.4 (< 0.1%)	5,831.1 (1.0%)	6,001.5 (0.7%)

Acres affected by operations impacts (52–110 years), categorized by the factors causing disturbance, are provided in Table 3.13-5. The relative locations where operations impacts would occur within GRSG habitat are shown on Figure 3.13-3 (Appendix Q). Alternative C would result in 170.4 acres of operations impacts to PHMAs, which would be the same as Alternative B. Alternative C would result in 5,831.1

acres of operations impacts to GHMAs, which would be more than Alternative B. Overall, Alternative C would directly cause 6,001.5 acres of operations impacts to HMAs (Table 3.13-5), which would be slightly more than Alternative B.

Similar to Alternative B, Alternative C would result in the same impacts to the Lost Dog Lek (0.4 mile from the water supply pipeline) (Table 3.13-6). Addition of the water supply pipeline could make this lek unviable in the long term.

Table 3.13-6. Leks within 4 Miles of Alternative C

Lek Name	Core Area	HMA Designation	Land Status	Distance to Project Area (miles)
Lost Dog/Highway 530*	Blacks Fork	PHMA	BLM	0.37
North Halfway Hollow	Blacks Fork	PHMA	Private	0.81
Little Dry Creek	Blacks Fork	PHMA	BLM	1.53
Little America 6	All Non-Core	GHMA	BLM	1.65
Massacre Hill	Blacks Fork	PHMA	BLM	2.16
East Peru	All Non-Core	GHMA	BLM	2.21
Lost Dog 4	Blacks Fork	PHMA	Private	2.84
North Buckboard	Blacks Fork	PHMA	Private	3.59
Peru	All Non-Core	GHMA	BLM	3.99

* Leks that require NSO stipulations.

The indirect impacts from Alternative C would be similar in type to those discussed under Alternative B, but would vary in intensity. Alternative C would result in 115,060 acres of indirect impacts to PHMAs, which is slightly less than Alternative B. Alternative C would result in 213,312 acres of indirect impacts to GHMAs, which is more than Alternative B. Overall, Alternative C would result in 328,371 acres of indirect impacts to HMAs, which is more than Alternative B. Alternative C's water supply pipeline ROW would also parallel 11.1 miles of WY 530. Additionally, Alternative C's transmission line ROW would also parallel 7.3 miles of I 80. The habitat along these parallel sections would not experience novel indirect impacts.

Alternative C would have the same indirect impacts on the same leks as Alternative B, minus the Solvay 2 Lek (where Alternative C is only within 4 miles of nine leks as opposed to 10). Furthermore, under Alternative C, the Little America 6 Lek would experience indirect impacts due to low structures, linear features, surface disturbance, and avian predation, whereas under Alternative B this lek would not experience increased indirect impacts due to increased avian predation. It should be noted that this lek is on the north side of I 80, whereas the transmission line ROW that would impact this lek is just south of I 80 and runs approximately parallel to I 80.

Under Alternative C, the same five leks would experience noise pollution of 10 dBA above ambient, as well as the Little America 6 Lek (six leks total) (Appendix H). The Project would need to limit noise pollution from 6 p.m. to 8 a.m. to keep levels below the 10 dBA above ambient threshold at these leks.

Under Alternative C, 397.5 acres of PHMA and GHMA would be subject to seasonal restrictions. PHMAs would comprises 148.7 acres of the water supply pipeline area in the Blacks Fork Core Area, 13.5 acres of the mine site access road area in the Uinta Core Area, 161.6 acres of the rail line and siding area in the Uinta Core Area, and 31.7 acres of the transmission line area in the Uinta Core Area. The

Little America 6 Lek is approximately 1.7 miles from the transmission line ROW and would result in 23.9 acres of GHMAs being subject to seasonal restrictions.

3.13.2.5 Alternative D (Preferred Alternative)

Acres affected by construction impacts (22–77 years), categorized by the factors causing disturbance, are provided in Table 3.13-7. The relative locations where construction impacts would occur within GRSG habitat are shown on Figure 3.13-4 (Appendix Q). Alternative D's construction impacts to GRSG habitat would be greater in GHMAs but would result in no impacts to PHMAs when compared to Alternative B and C. Alternative D would only result in 1,335.6 acres of construction impacts to GHMAs (Table 3.13-7).

Table 3.13-7. Alternative D Construction (27–77 years) and Operations (52–110 years) Direct Impacts to Greater Sage-Grouse Habitat

Disturbance Causing Factor	Acres of PHMA Disturbed (percentage of PHMA in analysis area)	Acres of GHMA Disturbed (percentage of GHMA in analysis area)	Total Acres (percentage of total habitat in analysis area)
Construction Impacts			
Brine/condensate pipelines temporary ROW	0 (0%)	258.5 (< 0.1%)	258.5 (< 0.1%)
Mine site access road temporary ROW	0 (0%)	67.2 (< 0.1%)	67.2 (< 0.1%)
Mine site transmission line temporary ROW	0 (0%)	218.6 (< 0.1%)	218.6 (< 0.1%)
Natural gas pipeline temporary ROW	0 (0%)	13.1 (< 0.1%)	13.1 (< 0.1%)
Processing facilities access road temporary ROW	0 (0%)	9.3 (< 0.1%)	9.3 (< 0.1%)
Processing facilities landfill access road temporary ROW	0 (0%)	2.8 (< 0.1%)	2.8 (< 0.1%)
Processing facilities transmission line temporary ROW	0 (0%)	5.4 (< 0.1%)	5.4 (< 0.1%)
Water intake access road temporary ROW	0 (0%)	5.3 (< 0.1%)	5.3 (< 0.1%)
Brine/condensate pipelines permanent ROW	0 (0%)	255.9 (< 0.1%)	255.9 (< 0.1%)
Mine site transmission line permanent ROW	0 (0%)	273.3 (< 0.1%)	273.3 (< 0.1%)
Natural gas pipeline permanent ROW	0 (0%)	26.1 (< 0.1%)	26.1 (< 0.1%)
Processing facilities transmission line permanent ROW	0 (0%)	6.8 (< 0.1%)	6.8 (< 0.1%)
Water intake transmission line permanent ROW	0 (0%)	162.7 (< 0.1%)	162.7 (< 0.1%)
Water supply pipeline permanent ROW	0 (0%)	30.6 (< 0.1%)	30.6 (< 0.1%)
Construction Impacts Total	0 (0%)	1,335.6 (0.2%)	1,335.6 (0.1%)
Operations Impacts			
Processing facilities access road permanent ROW	0 (0%)	13.9	13.9 (< 0.1%)
Processing facilities boundary	0 (0%)	1,109.2	1,109.2 (0.1%)
Processing facilities landfill access road permanent ROW	0 (0%)	1.8	1.8 (< 0.1%)
Rail line permanent ROW	0 (0%)	322.5	322.5 (< 0.1%)
Water intake access road permanent ROW	0 (0%)	5.4	5.4 (< 0.1%)

Disturbance Causing Factor	Acres of PHMA Disturbed (percentage of PHMA in analysis area)	Acres of GHMA Disturbed (percentage of GHMA in analysis area)	Total Acres (percentage of total habitat in analysis area)
Mine site access road permanent ROW	0 (0%)	100.7	100.7 (< 0.1%)
Project area	0 (0%)	4,644.1	4,644.1 (0.5%)
Operations Impacts Total	0 (0%)	6,197.6	6,197.6 (0.7)

Acres affected by operations impacts (52–110 years), categorized by the factors causing disturbance, are provided in Table 3.13-7. The relative locations where operations impacts would occur within GRSG habitat are shown on Figure 3.13-4 (Appendix Q). Alternative D would result in no operational impacts to PHMAs, but would result in 6,197.6 acres of operational impacts to GHMAs (Table 3.13-7), which is more than Alternatives B and C.

Unlike Alternatives B and C, Alternative D does not have any Project infrastructure situated within NSO zones. Therefore, Alternative D is not anticipated to have any direct impacts to leks. Table 3.13-8 lists the leks that are within 4 miles of the Alternative D footprint.

Table 3.13-8. Leks within 4 Miles of Alternative D

Lek Name	Core Area	HMA Designation	Land Status	Distance to Project Area (miles)
Blacks Fork 1	Blacks Fork	PHMA	BLM	3.9
Bryan 1	All Non-Core	GHMA	BLM	1.3
Little Dry Creek	Blacks Fork	PHMA	BLM	2.0
North Buckboard	Blacks Fork	PHMA	Private	3.6
North Halfway Hollow	Blacks Fork	PHMA	Private	0.8
Solvay 2	Blacks Fork	PHMA	BLM	3.4

The indirect impacts from Alternative D would be similar in type to those discussed under Alternatives B and C but would vary in intensity. Alternative D would result in 74,241 acres of indirect impacts to PHMAs, which is less than Alternatives B and C. Alternative D would result in 152,693 acres of indirect impacts to GHMAs, which is also less than Alternatives B and C. Overall, Alternative D would result in a total of 226,934 acres of indirect impacts to HMAs, which is less than Alternatives B and C. Substantial amounts of Alternative D's Project infrastructure would be collocated (Appendix Q, Figure 3.13-4), which would result in the reduction of indirect impacts to the HMAs.

Alternative D would have the same indirect impacts to the Solvay 2, Little Dry Creek, North Halfway Hollow, and North Buckboard Leks as Alternative C. Alternative D would be 3.9 miles away from the Black Forks 1 Lek; it should be noted that this lek is on the south side of I 80, whereas the various Project infrastructure (Appendix Q, Figure 3.13-4) that would impact this lek is just north of I 80. Alternative B would also be 1.3 miles away from the Bryan 1 Lek. Both the Black Forks 1 Lek and the Bryan 1 Lek would experience increased indirect impacts associated with low structures, linear features, surface disturbance, and avian predation.

Under Alternative D, leks would experience less noise pollution as compared to Alternatives B and C. Under Alternative D, three leks would experience noise pollution 10 dBA above ambient. The North Halfway Hollow Lek would experience the same noise pollution levels as compared to Alternatives B and C. The Little Dry Creek lek would still experience noise pollution 10 dBA above ambient, but the noise

pollution is predicted to be less than Alternatives B and C. The Bryan 1 Lek would also experience noise pollution 10 dBA above ambient (Appendix H). The Project would need to limit noise pollution from 6 p.m. to 8 a.m. to keep levels below the 10 dBA above ambient threshold at these leks.

Under Alternative D, 972.1 acres of GHMA would be subject to seasonal restrictions. The Bryan 1 Lek would be approximately 1.2 miles away from the Alternative D footprint, and GHMA would be within the processing facility boundary, water intake transmission line ROW, water supply pipeline ROW, and water intake access road ROW and therefore would be subject to seasonal restrictions.

Summary

Table 3.13-9 summarizes the direct and indirect impacts to GRSG for each alternative. In general, the impacts from each of these alternatives are similar in type and only vary due to placement of linear features (e.g., transmission line, access road, rail line, etc.), length of access roads and transmission lines, and the disturbance footprint (acreage impacted).

Table 3.13-9. Summary of Impacts to Greater Sage-Grouse

Alternative	PHMA (percentage of PHMA in analysis area) (acres)	GHMA (percentage of GHMA in analysis area) (acres)	Total (percentage of all HMA in analysis area) (acres)
Analysis area			
Acres	334,957.7	587,814.5	922,772.2
Alternative B (Proposed Action)			
Construction (27–77 years) direct disturbance acreages (percentage of habitat in analysis area)	153.4 (< 0.1%)	392.9 (0.1%)	546.3 (0.1%)
Operations (52–110 years) direct disturbance acreages (percentage of analysis area)	170.4 (0.1%)	5,822.6 (1.0%)	5,992.7 (0.6%)
Indirect disturbance acreages (percentage of habitat in analysis area)	117,796.8 (35.2%)	202,598.6 (34.5%)	320,395.4 (34.7%)
Seasonal restrictions	324.0 (0.1%)	0 (0%)	324.0 (< 0.1%)
Alternative C			
Construction (27–77 years) direct disturbance acreages (percentage of habitat in analysis area)	185.1 (0.1%)	413.8 (0.1%)	598.9 (0.1%)
Operations (52–110 years) direct disturbance acreages (percentage of analysis area)	170.4 (< 0.1%)	5,831.1 (1.0%)	6,001.5 (0.7%)
Indirect disturbance acreages (percentage of habitat in analysis area)	115,060.2 (34.4%)	213,311.8 (36.3%)	328,372.0 (35.6%)
Seasonal restrictions	373.6 (0.1%)	23.9 (< 0.1%)	397.5 (< 0.1%)
Alternative D			
Construction (27–77 years) direct disturbance acreages (percentage of habitat in analysis area)	0 (0%)	1,335.6 (0.2%)	1,335.6 (0.1%)
Operations (52–110 years) direct disturbance acreages (percentage of analysis area)	0 (0%)	6,197.6 (1.0%)	6,197.6 (0.6%)
Indirect disturbance acreages (percentage of habitat in analysis area)	74,241 (22.2%)	152,693 (26.0%)	226,934 (24.6%)
Seasonal restrictions	0 (0%)	972.1 (0.2%)	972.1 (0.1%)

3.13.2.6 *Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity*

Potentially irretrievable impacts from the Project include permanent loss and degradation of GRSG, permanent habitat fragmentation, and increases in noise pollution. Project infrastructure would result in habitat avoidance and increased predation potential by avian predators on GRSG.

Surface disturbance would be associated with construction, operations, and decommissioning activities resulting in impacts spanning 27 to 77 years (construction disturbance), impacts spanning 52 to 110 years (activities associated with the operations of the Project), and potential irreversible impacts (post-decommissioning if reclamation is not carried out or is unsuccessful).

Instances where construction and operations activities permanently change vegetation composition and structure (e.g., permanent loss of shrub component or increased spread of nonnative grasses) due to unsuccessful reclamation present potential irreversible impacts to GRSG habitat. Any leftover infrastructure that is abandoned and not reclaimed, such as the transmission line, rail line, and access roads, would result in continued indirect impacts and degradation of GRSG habitat.

3.13.2.7 *Cumulative Impacts*

Cumulative impacts to GRSG resulting from RFFAs would occur due to vegetation disturbance and surrounding habitat degradation. Surface-disturbing activities would directly remove necessary vegetation for GRSG habitat (e.g., sagebrush) and lead to degraded GRSG habitat after reclamation. RFFAs creating additional linear features and tall structures would also degrade GRSG habitat. Overall, any RFFA constructing new features would degrade GRSG habitat within a 4-mile radius of the Project footprint. RFFAs causing minor habitat loss and fragmentation, such as the paleontological excavation (< 0.1 acre), the Green River to Buckboard Fiber Optic (2.7 acres), the Skyline ADA Trail (11.0 acres), the 4-stall RV Station (< 0.1 acre), and the Wilkins Peak Mountain Bike Trail Expansion (38.3 acres), would result in minor habitat loss and degradation to GHMA. RFFAs, such as road improvements and structure repairs, would have negligible impacts on GRSG and would not cause novel habitat destruction. These projects typically occur in urban areas or within/near I 80 or WY 374. Although many of these projects would not cause significant GRSG loss, noise impacts, especially when combined with the noise pollution of the selected alternative (if noise restrictions are not adhered to), could lead to noise pollution that exceeds ambient levels by 10 dBA.

The most notable RFFAs with the potential for significant large-scale negative cumulative impacts on GRSG would be linked to the proposed American Soda Solution Mining Expansion, Project West, and Sweetwater Carbon Storage Hub Project. The American Soda Solution Mining Expansion would impact 35,668 acres of PHMA and GHMA. The Uinta PHMA would sustain substantial impacts due to the expansion, and it would also be entirely bisected by its boundary. Indirect impacts, such as linear features and surface-disturbing activities, would extend 4 miles from the Project footprint, resulting in more extensive impacts than those reported for the expansion. It is reasonable to assume that there would be substantial habitat loss, degradation, and fragmentation within the Uinta PHMA due to the American Soda Solution Mining Expansion.

Project West's footprint would impact 3,722 acres of GHMA and PHMA, with most of these effects occurring in GHMA. The impacts on PHMA would result from the fluid transport line and the water supply pipeline, which would affect the Uinta and Black Forks PHMAs, respectively. Indirect impacts from these linear features and surface disturbances stemming from construction and mining activities would extend 4 miles out from Project West's footprint, resulting in more significant impacts than those reported for the Project footprint.

Should either Alternative B or C be selected, the Uinta PHMA would experience substantial degradation if both Project West and, particularly, the American Soda Solution Mining Expansion proceed. The Sweetwater Carbon Storage Hub Project footprint would only impact 3,837 acres of GHMA. However, indirect impacts resulting from surface disturbance and linear features extending out 4 miles from the respective projects could lead to habitat degradation in the nearby Seedskadee PHMA. Finally, noise impacts from these three projects (American Soda Solution Mining Expansion, Project West, and Sweetwater Carbon Storage Hub Project), particularly when combined with the noise pollution of the selected alternative (if noise restrictions are not adhered to), could lead to noise pollution that exceeds ambient levels by 10 dBA.

Overall, should these mining RFFAs proceed, particularly in conjunction with the Project and specifically Alternatives B and C, GRSG populations within the analysis area and its surrounding region would probably undergo significant population declines. This decline would be due to the substantial increase in habitat loss, degradation, and fragmentation compared to the conditions present in the analysis area before the commencement of these projects.

3.14 Livestock Grazing

Grazing allotments are discrete areas used by federal agencies to manage grazing on public lands. The livestock grazing section of this document considers how the construction, operations, maintenance, and reclamation of the Project infrastructure would impact livestock grazing on the Granger Lease and Rock Springs Allotments—the two BLM allotments intersected by Project development. Grazing allotments have stocking rates, which determine how many livestock can be supported by the forage available in a grazing allotment area. Stocking rates are measured in Animal Unit Months (AUMs). One AUM is equal to the amount of forage necessary to sustain one cow or its equivalent for a month (43 CFR 4100.0-5). Livestock operators can hold a grazing permit that authorizes them to graze within an allotment for a specified period of time up to a certain AUM value. Permitted AUMs are used in this analysis, as available, to more accurately represent Project impacts to AUMs.

The Rangeland Analysis Platform (RAP) has a Production Explorer tool that can estimate average stocking rates for allotments based on remotely sensed estimates of available forage in a given area (Jones et al. 2021). The RAP was used in this analysis to estimate impacts to AUMs in the grazing areas that would be disturbed or made unavailable to grazing under the different alternatives. RAP provides the most consistent data source for comparison of impacts across the Project area; however, the BLM has not ground-truthed the data from RAP in the analysis area, nor does the BLM make stocking rate decisions based on RAP data. Therefore, RAP is only being used for comparison and analysis purposes and may not actually indicate the actual number of AUMs available on the ground. Additionally, RAP estimates in this analysis represent the entire area of each pasture or in-holder area, rather than the area of BLM lands alone.

The analysis area for this resource consists of the Massacre Hill, Church Buttes, and Little America pastures of the Granger Lease Allotment and the area of the Rock Springs Allotment west of the Green River and U.S. Highway 191 (US 191), as these parts of the Granger Lease and Rock Springs Allotments represent the area that could be potentially impacted by the Proposed Action and alternatives (Appendix Q, Figure 3.14-1). Grazing use within the Rock Springs Allotment is generally divided between the Rock Springs Grazing Association, which uses the entire allotment, and a number of “in-holders” who use designated in-holder use areas. Because of this, the impact analysis evaluated impacts to the larger Rock Springs Allotment area, as well as impacts to individual in-holder use areas.

3.14.1 Affected Environment

3.14.1.1 Granger Lease Allotment

The Granger Lease Allotment is the BLM grazing allotment that overlaps most of the Project footprint. The allotment is split into two contiguous parcels, with the southern parcel bisected by I 80. This allotment comprises 470,680 acres and produces 13,675 permitted AUMs annually. The Massacre Hill pasture, which constitutes the portion of the Granger Allotment south of I 80, comprises 239,557 acres and has 11,851 AUMs permitted annually by the BLM on Permit #4900276 and Permit #4913328, with 9,601 of those AUMs for sheep grazing and 2,250 AUMs for cattle grazing. Estimates of annual forage production based on remotely sensed imagery between 2018 and 2022 from the RAP show that the Massacre Hill pasture provides an annual average of 11,716 AUMs (Jones et al. 2021).

The Church Buttes pasture and Little America pasture, which constitute the portion of the Granger Allotment north of I 80 that would be impacted by the Project, comprise 101,757 acres combined and have 1,824 AUMs permitted annually by the BLM on Permit #4900929, Permit #4912003, and Permit #4912897. All AUMs are for sheep grazing. Estimates of annual forage production based on remotely sensed imagery between 2018 and 2022 from the RAP show that the Church Buttes and Little America pastures provide an annual average of 4,909 AUMs (Jones et al. 2021).

3.14.1.2 Rock Springs Allotment

The Rock Springs grazing allotment spans 2.1 million acres of public, private, and state-owned lands. Approximately 1 million acres of the allotment are on public land managed by the BLM. There are two primary grazing systems within the allotment. The Rock Springs Grazing Association grazes livestock throughout all 2.1 million acres, primarily during the winter months. However, there are also 18 livestock operators that own private land within the allotment and graze livestock, primarily during the summer months, within designated “in-holder use areas.”

Because the Rock Springs Allotment is large and spans numerous areas that would not be affected by the Project, a smaller portion of the allotment was designated as the analysis area for livestock grazing (Appendix Q, Figure 3.14-1). This portion of the analysis area spans 62,779 acres and excludes the four in-holder use areas that may be impacted by the Project, which were analyzed separately (Aimone, Hamel, Tripp, and Triple A Cattle Company). Throughout the remainder of this document, this portion of the analysis area will generally be referred to as the “Rock Springs Allotment.” Total forage production throughout this area is estimated at 3,892 AUMs. It is important to note that these estimates are based on data from the RAP Production Explorer tool and they include all land ownership (not just BLM land). Impacts to the four in-holder use areas are discussed in detail in this analysis. Within the four in-holder use areas, BLM permits 1,833 AUMs. The four in-holder use areas are grazed primarily by cattle, with 30 AUMs allocated to horses.

BLM permitted AUMs in the relevant allotments and in-holder areas in the Rock Springs Allotment are outlined in Table 3.14-1. RAP remote-sensing estimates of AUMs are provided for comparison.

Table 3.14-1. Permitted Animal Unit Months in Massacre Hill, Church Buttes, Little America, Rock Springs Allotment, and Rock Springs In-Holdings Impacted by the Project

Allotment Area or In-Holder Area	Acres	Permitted Animal Unit Months	RAP Estimated Animal Unit Months
Massacre Hill	239,556	11,851	11,716

Allotment Area or In-Holder Area	Acres	Permitted Animal Unit Months	RAP Estimated Animal Unit Months
Church Buttes and Little America	101,757	1,824	4,909
Rock Springs	62,779	3,892 [†]	3,892
Aimone	36,370	504	2,220
Hamel	20,996	265	1,348
Tripp	41,729	816	2,008
Triple A Cattle Company	17,501	248	964
Total in analysis area	520,688	19,400	27,057

Source: BLM (2023).

[†] For the Rock Springs Allotment, only RAP-estimated data were available to provide the most accurate AUM estimates and are therefore reported here.

3.14.2 Environmental Consequences

3.14.2.1 Analysis Method

To determine impacts to livestock grazing, RAP-generated estimates of the percent of total AUMs in each allotment, pasture, or in-holder area that would be impacted under each alternative were applied to the permitted AUMs of those areas. Additionally, linear measurement of features that could serve as barriers to livestock movement or pose a danger to livestock, including the railway, access roads, or fenced-in Project elements within each allotment, were analyzed to determine the degree of impediment to livestock movement or danger posed to livestock associated with each alternative. Analysis assumptions included the following:

- Data from the RAP Production Explorer tool represents the best available science and would be used to assess forage production throughout the analysis area.
- Areas impacted by buried infrastructure would be revegetated and would not represent a long-term loss of forage. Revegetation efforts would result in similar forage levels that were present prior to Project disturbance. A short-term loss of vegetation would occur prior to revegetation.
- Any linear feature more than 18 inches tall is a barrier to livestock movement. However, transmission lines would not create an impediment to livestock grazing or loss of forage, with the exception of pole foundations.
- All forage in the footprint of the developed mine well field, its gathering lines, ponds, and the processing facility would be unavailable for grazing use.

Impact indicators included the following:

- Areas of ground disturbance (acres)
- Areas of the Project that would be fenced (acres)
- Length of rail lines and access roads (miles)

The analysis was conducted by using the permitted AUMs for the analysis area (comprising the Massacre Hill, Church Buttes, and Little America pastures of the Granger Allotment, the Rock Springs Allotment, and the Rock Springs Allotment in-holder areas that physically intersect Project infrastructure). Only the operators using the western portion of the Rock Springs Allotment would be impacted by the proposed

Project. Therefore, as previously stated, the analysis was confined to the area of the Rock Springs Allotment to the west of US 191 and the Green River.

To calculate impacts to grazing, RAP was used to calculate average AUMs from 2018 to 2022 for each of the allotment pasture areas or in-holder areas that comprise the analysis area, for the area of overlap between each of the allotment pasture areas or in-holder areas, and for the total disturbance area under each alternative. These AUM estimates were then used to determine what percentage of the total estimated AUMs in each allotment pasture or in-holder area would be impacted under each alternative (i.e., what percent of the total estimated AUMs for a pasture or in-holder area is represented by the AUMs in the area where the pasture or in-holder area intersects Project disturbance). That calculated percentage value was then applied to the permitted AUM values for each allotment pasture or in-holder area to determine how many permitted AUMs would be impacted under each alternative. No discrete permit data were available to accurately represent the Rock Springs Allotment. Instead, the RAP-generated average AUM value for the portions of the Project area that overlap the Rock Springs Allotment was reported for each alternative.

3.14.2.2 *Alternative A (No Action)*

Under the No Action Alternative, no additional expansion onto BLM- or USFS-administered lands would occur. No ground disturbance would occur, and there would be no changes or alterations to the landscape; therefore, there would be no impacts to livestock grazing resources and no reduction in forage due to the Project. Existing conditions and trends in the analysis area would continue.

3.14.2.3 *Alternative B (Proposed Action)*

Construction of all Project features, including new access roads, the rail line, pipelines, transmission line, and the entire fenced-in Project area, would require vegetation clearing and grading. Such activity would remove available forage from the analysis area, precluding livestock from grazing in areas that have been cleared. Ground disturbance and vegetation removal would reduce the quantity of forage available to livestock on the landscape, thereby decreasing the AUMs that the analysis area can support. Additionally, all fenced areas of the Project would exclude livestock and become unavailable for grazing. Fencing of Project elements would also prevent trailing activity, necessitating new routes for trailing livestock if such routes existed in the newly fenced areas. The 37 miles of new transportation routes, the access roads, and rail line would also potentially pose a threat to livestock on the landscape as the risk of collisions would increase due to the presence of these transportation elements. Collisions could result in loss of livestock. However, the Applicant would set speed limits for Project traffic to mitigate risk of such collisions (30 mph on-road and 15 mph off-road) and would adjust such speed limits and consider fencing or signage should the Project result in an unacceptable level of collisions between Project vehicles and livestock (Barr Engineering 2022). Rail line speed limits would be set at 40 mph or lower, according to the Mine Plan, to reduce collisions. No fencing along the rail line would be constructed due to the potential for increased adverse effects on various wildlife or livestock. Necessary mitigation measures for preventing collisions would be identified when Pacific Soda prepares an Adaptive Wildlife Management Plan for the Project. Grazing lessees would also be notified of any livestock-vehicle collisions.

Project traffic on new and existing routes near and within grazing allotments could also result in increased levels of dust, which may cause livestock health impacts, such as eye irritation and respiratory issues (McCrea 1984; Stuttgen 2020), although these livestock production losses may be minor (Aleadelat and Ksaibati 2017). Increased dust deposition can also lead to reduced photosynthetic efficiency for plants, which can reduce the productivity and vitality of vegetation over time (Ulrichs et al. 2008). Dust can also reduce the palatability of plants for livestock (Oregon State University 2023). Such impacts may reduce the amount of forage available for livestock in areas near roadways where fugitive dust is deposited.

However, the implementation of speed limits, as mentioned in the paragraph above, would also reduce the generation of fugitive dust. Dust monitoring and control would be implemented throughout the life of the Project, per the Project's Fugitive Dust Control Plan.

Under Alternative B, the Project would create 7,211.08 total acres of disturbance over the anticipated 34-year span of the Project. The fenced-in Project elements in the Project area would represent a loss of 4,980.76 total acres of grazing availability when the entire Project is developed and fencing is complete. BLM-approved cattle guards would be used on pre-approved access roads to prevent cattle from entering the Project area. Fencing off the Project area would make the old trailing routes that cross this area obsolete and would necessitate the development of new trailing routes. The fenced Project area may present an impediment to livestock movement, which could indirectly reduce the ability of livestock to access forage in other portions of an allotment or pasture. Additionally, the fragmentation of grazing allotments may occur, possibly leading permittees to adjust their grazing pasture uses and/or rotations during the construction and reclamation phases. This could happen due to fenced-off areas and the placement of access roads and other facilities. While access roads could provide benefits to permit holders by offering alternative access to grazing allotments, water resources, and grazing facilities, they may also increase the potential for conflicts between livestock operators and other public land users. Furthermore, the construction of access roads in grazing regions could encourage livestock to use these roads as travel routes.

The presence of noxious weeds may be affected by construction activities that transport seeds throughout the Project area. The development of new or improved roads and infrastructure would also heighten the risk of introducing and spreading noxious weeds across the grazing allotments, which can displace more desirable forage species for livestock. To prevent the degradation of forage caused by the introduction of noxious weeds during construction, the Noxious and Invasive Weed Management Plan (Appendix G of the Mine Plan) will be implemented.

Range improvements, including fences, gates, cattle guards, and stock tanks, might be directly removed or disturbed due to construction activities. Additional impacts could arise from potential damage to these structures, which may lead to the accidental release of livestock. Long-term range monitoring sites could also be adversely affected or disturbed as a result of construction activities.

It is important to note that there would be temporal variation in the impacts caused by certain Project elements. Some of this disturbance and AUM loss would likely be regained in two to three growing seasons following construction and reclamation. Following construction, temporary easements would be reclaimed and revegetated. Certain features of Project infrastructure, such as the natural gas pipeline and the water supply pipeline, would be sited underground and the area on top of these elements could be reclaimed in two to three growing seasons once construction (which would take place between years 1 and 3) is complete. Together, the total disturbed area of the natural gas pipeline and water supply pipeline represent 271.29 acres that would soon become re-available for grazing. In addition, after construction, the 205.6-acre transmission line ROW would not represent a physical barrier to livestock movement, nor would it represent a long-term loss of forage (with the exception of poles and bases). Overall losses of forage and associated AUMs in these areas would therefore be reduced once construction is complete and reclamation work has taken place.

Additionally, due to the phased nature of the development work, not all disturbance or impacts to AUMs would occur at once. Fencing in Sections 22, 25, 26, and 27 would begin during the first 5 years of construction, leaving other sections (Sections 23, 24, and 35) available for grazing and trailing use. Sections 23 and 24 would be developed and fenced starting in year 7 and year 8, respectively, and Section 35 would be developed and fenced starting in year 14. For all mine well field sections (Sections 23, 24, 25, 26, and 35), the construction, closure, reclamation, and vegetation monitoring/bond release process is anticipated to span 20 years per section, meaning that sections developed earlier in the construction process could already be reclaimed when the final reclamation process begins. Decommissioning of all

infrastructure and final reclamation would be initiated around year 28, with vegetation monitoring and the release bond anticipated around year 35.

In total, roughly 183 permitted AUMs would be impacted under Alternative B, which is 0.94% of the total permitted AUMs available in the analysis area (with RAP estimates used for the Rock Springs Allotment). The Massacre Hill pasture in the Granger Allotment would be the most impacted of all grazing areas analyzed. Alternative B would not result in the loss of more than a single permitted AUM on all relevant in-holder areas in the Rock Springs Allotment. Table 3.14-2 outlines permitted AUMs and acres impacted under Alternative B in the analysis area, in addition to RAP-generated estimates of the percent of AUMs lost in each discrete grazing area in the analysis area.

Table 3.14-2. Acres and Permitted Animal Unit Months Impacted Under Alternative B

Livestock Grazing Allotment	Acres	Permitted AUMs Impacted	Percentage of Total AUMs Impacted
Massacre Hill Pasture of the Granger Allotment	5,897.8	176	1.49%
Church Buttes and Little America Pastures of the Granger Allotment	163.2	2	0.10%
Rock Springs Allotment	113.4	5*	0.13%
Aimone In-Holder Area	24.5	< 1	0.09%
Hamel In-Holder Area	0.0	0	0.00%
Triple A In-Holder Area	26.5	< 1	0.10%
Tripp In-Holder Area	0.0	0	0.00%

Source: BLM (2023).

* For the Rock Springs Allotment, no billed or active AUM data were available to accurately represent the western portion of the allotment. Therefore, RAP data alone represents impacts to the Rock Springs Allotment. Permitted data were used to calculate AUMs impacted for all other areas.

3.14.2.4 *Alternative C*

Impacts to grazing under Alternative C would be similar in nature to those under Alternative B but would be different in scope. Under Alternative C, the Project would create 7,272.47 acres of disturbance, which is roughly 61 more acres than Alternative B, resulting in greater grazing potential loss. The transmission line ROW would encompass 280.5 acres under Alternative C, which is 75 more acres of grazing loss than under Alternative B, with probable greater long-term disturbance implications due to poles and base structures, which could reduce grazing potential. Additionally, the 39 miles of ROWs for the rail line and the new access roads, which is 2 miles more than under Alternative B, would present a greater risk to livestock due to the additional collision potential presented by additional mileage.

In total, roughly 253 permitted AUMs, or 1.30% of all permitted AUMs available in the analysis area, would be impacted under Alternative C, approximately 70 more AUMs impacted than under Alternative B based on permitted AUM data (with RAP estimates used for the Rock Springs Allotment). This would be a 38.3% increase in AUMs impacted compared to Alternative B. The Massacre Hill pasture of the Granger Allotment would still be the most impacted of all grazing areas analyzed, resulting in a greater loss of AUMs to grazers operating in the Massacre Hill pasture. Table 3.14-3 presents estimates of AUMs lost based on permitted AUMs, in addition to the percentage of AUMs lost using RAP AUM estimates, for each discrete grazing area in the analysis area.

Table 3.14-3. Acres and Permitted Animal Unit Months Impacted Under Alternative C

Livestock Grazing Allotment	Acres Impacted	Permitted AUMs Impacted	Percentage of Total AUMs Impacted
Massacre Hill Pasture of the Granger Allotment	5,985.7	246	2.07%
Church Buttes and Little America Pastures of the Granger Allotment	140.9	2	0.08%
Rock Springs Allotment	113.4	5*	0.10%
Aimone In-holder Area	24.5	< 1	0.09%
Hamel In-Holder Area	0.0	0	0.00%
Triple A In-Holder Area	26.5	< 1	0.10%
Tripp In-Holder Area	0.0	0	0.00%

Source: BLM (2023).

* For the Rock Springs Allotment, no billed or active AUM data were available to accurately represent the western portion of the allotment. Therefore, RAP data alone represent impacts to the Rock Springs Allotment. Permitted data were used to calculate AUMs impacted for all other areas.

3.14.2.5 *Alternative D (Preferred Alternative)*

Under Alternative D, the Project would create 8,393.68 acres of disturbance, roughly 1,182.60 more acres of disturbance than under Alternative B. Pipeline features under Alternative D that would be reclaimed in two to three growing seasons after construction include the natural gas pipeline, brine condensate pipeline, and water supply pipeline permanent and temporary ROWs, representing 645 acres. This area would be 374 acres larger than under Alternative B. In addition, the permanent ROWs for the water intake transmission line, processing facilities transmission line, and mine site transmission line, which could be restored following construction, represent 442.8 acres under Alternative D (237.2 acres more than under Alternative B). The acreage values for the underground and transmission line features under Alternative D indicate that although there would be additional disturbance under Alternative D, some of that additional disturbance is attributable to areas that could be reclaimed in a short time period.

Under Alternative D, 1,109.19 acres representing the processing facilities would be fenced and unavailable for grazing or trailing activity, which is larger than under Alternative B. Additionally, the 40 miles of ROWs for the new access roads—3 miles greater than under Alternative B—would present a greater risk to livestock due to the collision potential presented by additional mileage.

Impacts to grazing under Alternative D would be similar in nature to those under Alternative B but would be different in scope. In total, roughly 272 permitted AUMs, or 1.40% of all permitted AUMs available in the analysis area, would be impacted under Alternative D (with RAP estimates used for the Rock Springs Allotment). This would represent approximately 89 additional permitted AUMs than under Alternative B (a 48.63% increase in AUMs impacted). As under Alternative B, the Massacre Hill pasture of the Granger Allotment would be the most impacted of all grazing areas analyzed. Alternative D also presents the greatest potential loss of AUMs in in-holder areas, with the loss of 17 permitted AUMs in the Aimone In-Holder Area. Such a loss may be noticeable to the in-holder permittee due to the smaller size of the pasture area. Table 3.14-4 presents estimates of AUMs lost based on permitted AUMs, in addition to the percentage of AUMs lost using RAP AUM estimates, for each discrete grazing area in the analysis area.

Table 3.14-4. Acres and Permitted Animal Unit Months Impacted Under Alternative D

Livestock Grazing Allotment	Acres	Permitted AUMs Impacted	Percentage of Total AUMs Impacted
Massacre Hill Pasture of the Granger Allotment	5,513.7	250	2.11%
Church Buttes and Little America Pastures of the Granger Allotment	137.9	1	0.08%
Rock Springs Allotment	61.7	4*	0.10%
Aimone In-holder Area	1,220.0	17	3.42%
Hamel In-Holder Area	60.6	< 1	0.30%
Tripp In-Holder Area	11.3	0	0.00%
Triple A In-Holder Area	0.0	0	0.00%

Source: BLM (2023).

* For the Rock Springs Allotment, no billed or active AUM data were available to accurately represent the western portion of the allotment. Therefore, RAP data alone represents impacts to the Rock Springs Allotment. Permitted data were used to calculate AUMs impacted for all other areas.

3.14.2.6 Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity

There would be effects on livestock grazing in the analysis area if ROWs are granted for the proposed Project. These effects would include ground disturbance and removal of forage during construction activity and the installation of facilities. Irretrievable impacts to livestock grazing, mainly loss of forage resulting in reduced AUM capacity, would occur as a result of the proposed Project. For disturbance caused by underground infrastructure, forage would be reclaimed faster, as once the infrastructure is constructed and buried, forage could be reestablished in the disturbed area, likely in two to three growing seasons. Forage that is removed or included in fenced areas of the Project would be lost for varying durations based on the staggered construction plan for the various sections. However, once constructed, forage disturbed by aboveground Project facilities would be unavailable for the duration of the Project until reclamation has successfully been implemented.

Once the constructed elements of the mine are decommissioned and fencing is removed, the Project area would be reclaimed to conditions compatible with any pre-mining uses, including livestock grazing. The disturbed areas would be re-seeded and fenced off to livestock for 2 years after final re-seeding to allow vegetation to establish. If re-seeding efforts prove successful, grazing activity would then be allowed to recommence as allowed under the applicable RMPs. Therefore, there would not be an irreversible loss of forage and trailing capacity resulting from the Project.

There would be long-term impacts on livestock grazing under all action alternatives through decreases in public land available for grazing and trailing use. Long-term impacts to land uses would be expected for the duration of the Project for the areas in which the physical occupation of the mining facilities, rail line, and access roads would potentially preclude grazing and trailing activities; these long-term impacts would occur for the life of the Project until decommissioning and restoration are completed. However, only a small portion of the total AUMs available in the analysis area would be impacted by the Project, with loss of AUMs under all action alternatives ranging from 0.94% to 1.40% of total permitted AUMs. This means that long-term use of the Project area would not jeopardize the long-term stocking capacity of the total analysis area.

3.14.2.7 Cumulative Impacts

RFFAs with the potential to impact livestock grazing include any actions that would disturb and remove surface vegetation, thereby reducing the amount of forage available for livestock to graze and the number of AUMs that the analysis area can support. It is anticipated that all RFFAs in the analysis area would cause short-term and/or long-term vegetation removal to some extent. RFFAs would therefore exacerbate the impacts to grazing resources in the analysis area. RFFAs would impact an estimated 39,656 acres of the livestock grazing analysis area. However, highway or interstate improvement and repair RFFAs are anticipated to have smaller footprints largely outside of fenced pastures and would have limited, if any, impact on grazing. Such roadway improvements account for 276 acres of the total RFFA disturbance area.

Any RFFAs that may result in developing and/or fencing off areas of grazing allotments would reduce available forage and thereby decrease available AUMs in the analysis area. Such development may also require the development of new linear transportation routes, increasing risk of collisions with livestock. Such RFFAs may include the American Soda Solution Mining Expansion (35,668 acres in the analysis area) and Project West (3,709 acres in the analysis area). The American Soda Solution Mining Expansion and Project West would be located in the Granger Allotment. Both projects would likely result in substantial direct and indirect impacts to grazing resources within the analysis area of a similar nature to those of the proposed Project, resulting in greater impacts to livestock grazing under any of the action alternatives.

Notably, the Rock Springs Allotment portion of the analysis area has been impacted by a variety of development activities. Trona mining, utility transmissions, gravel mines, and roadways are the primary sources of disturbance within this area. Overall, an estimated 7.6% of the cumulative impact analysis area has been impacted by development activities, both past and present. These have affected approximately 806 livestock AUMs. Some of these AUMs have been restored through reclamation efforts. Impacts in the Rock Springs Allotment and in-holder area are summarized in Table 3.14-5.

Table 3.14-5. Existing Disturbance Acreage and Animal Unit Months Impacted in the Rock Springs Allotment

In-holder Area	Total Acres	Acres Disturbed	Percentage Disturbed	Number of Affected AUMs
Rock Springs	62,779	4,808	7.66%	298
Aimone	36,370	2,618	7.20%	160
Hamel	20,996	1,905	9.07%	122
Tripp	41,729	3,495	8.38%	168
Triple A Cattle Company	17,501	1,048	5.99%	58
Total	179,375	13,874	–	806

In total, each of the alternatives analyzed in this EIS would add far less than 1% to the total number of AUMs that have been affected by past and present disturbances within the analysis area. Because much of the Granger Allotment portion of the analysis area is a KSLA, drilling pads are rarely allowed; therefore they have not caused impacts to AUM availability as they have for the Rock Springs Allotment.

Overall, if mining RFFAs proceed in addition to the Project, there would be greater losses of vegetation and available forage, which would reduce the number of AUMs that could be supported by the analysis

area. New transportation routes may also be developed, which would increase risk of collisions with livestock. The greatest impacts to livestock grazing would occur under Alternative D.

3.15 Health and Human Safety/Hazardous Materials

The Project proposes to use the solution mining method in the four deepest trona beds (Trona Beds 1–4) that occur at depths of approximately 2,300 to 2,215 feet bgs, which is too deep to access safely through surface mining or conventional underground mining methods. As described in the Mine Plan (Appendix C), the solution mining method involves using a combination of one horizontal and two vertical wells to inject a hot water solution (158°F) of 1% to 2% sodium carbonate into the trona deposit and to recirculate it to dissolve the mineral. Once the resulting brine reaches the desired alkalinity, it is pumped to the surface through one of the vertical wells for refining. The refining process includes filtration to remove impurities, after which water is evaporated and the resulting slurry is centrifuged to separate the remaining water from the soda ash crystals, which are then sent to driers, screened, and put into storage bins for transport.

The proposed solution mining method eliminates the health and human safety issues associated with underground mining operations; however, health and human safety and hazardous materials issues are associated with the refinery, co-generation facility, storage pond, surge pond, landfill, and the solution injection and recovery pipelines, as well as the infrastructure (i.e., railroad, 230-kV transmission line, natural gas line, water pipeline, and access road) required to support the solution mining process.

Particle sizes of light soda ash range from 75 to 425 microns (μm) and dense soda ash range from 150 to 600 μm (Tata Chemicals 2022), which indicates that these particulates can be aerially distributed under windy weather conditions. Also, the mining solution (1%–2% sodium carbonate) and recovered brine (total alkalinity of 11%–14%) could be aerially dispersed through small leaks (pinholes) in the injection and/or recovery pipelines under operating pressures of 266 psi. Thus, the analysis area for health and human safety and hazardous materials is the footprint of the surface refining process facilities and infrastructure plus a 250-foot buffer around the footprint.

3.15.1 Affected Environment

Impacts to human health and safety can result from routine solution mining operations, brine refining, minerals transportation, and generation and disposal of solid and hazardous materials, as well as from accidental spills or releases of mining materials, byproducts, and/or waste products. Although soda ash (sodium carbonate) does not qualify as a hazardous waste under 40 CFR 261, it is listed as a hazardous substance under the Globally Harmonized System of Classification and Labelling of Chemicals. The Safety Data Sheet for soda ash lists it as an irritant that may be harmful if it is swallowed, inhaled, or comes in contact with the skin or eyes; therefore, exposure to airborne sodium carbonate particulates and/or liquids (mists) could impact human health and safety. The potential for human health and safety impacts from subsurface solution mining operations is minimal, whereas the potential for impacts to human health and safety is greater from surface operations and facilities, such as brine refining plants, the co-generation facility, bulk mineral loading into rail cars and transportation to market, solution mining liquids and brine return piping systems, storage ponds, surge ponds, and the landfill.

Impacts to human health and safety can also occur from solid and hazardous wastes generated from mining and processing operations. As described in the Appendix L of the Mine Plan, solid wastes associated with the solution mining and sodium carbonate processing activities would typically be non-hazardous and would generally consist of regular trash, water treatment sand filter media, cartridge filter elements, column internals (demisters, packing), baghouse filters, overburnt/unburnt calcium carbonate, sludge/sediment from storage and surge ponds, and miscellaneous debris that would be disposed of in the

on-site landfill. Any toxic or hazardous wastes generated from mining operations, such as used oil, truck shop waste (e.g., air filters, tires, etc.), causticizer scaling (calcium carbonate, magnesium carbonate, and sodium carbonate cleaned with acid), and used electrical equipment would be disposed of at an approved off-site facility. Permitting of the on-site solid waste landfill, in conjunction with proper on-site storage and off-site transportation and disposal of toxic and/or hazardous wastes at approved facilities would minimize impacts to human health and safety from these materials.

The affected environment is the footprint of the Project's surface components (e.g., solution mining and brine return pipelines, refinery, co-generation facility, rail car loading structure and railroad tracks, natural gas pipeline and conditioning skid, water pipeline, landfill, surge pond, sanitary water treatment pond, storage pond, mining solution injection and brine recovery pipelines and pump stations, and well pads) plus a 250-foot buffer from the structure footprint. Bulk shipment of soda ash in hopper-style rail cars and trucks opens the potential for aerial distribution of soda ash particulates during loading and transport or in the event of releases from rail or truck accidents. In addition, leaks/releases from the solution mining liquids and return brine pipelines opens the potential for sodium carbonate-containing mists to be aurally distributed within the 250-foot buffer zone.

Potential impacts from spills or releases from refinery facilities and/or surface infrastructure components can be exacerbated by the prevailing weather conditions at the time of a spill or release. Wind speed and direction can influence the dispersion of soda ash particulate matter and/or mists (e.g., solution mining and brine liquids) that may be released during surface infrastructure operations, such as bulk soda ash rail car loading and transport, solution mining and brine surface pipelines, brine processing plants, and liquid storage ponds. Information from the Rock Springs Airport (National Oceanic and Atmospheric Administration 2023) indicates that the prevalent wind direction (i.e., approximately 22% of the time) is from the west-southwest, with wind speeds greater than 22.6 miles per hour (10.1 m per second). The impact area from releases of solution mining liquids and/or processed soda ash particulates from surface infrastructure components would be extended to the east northeast under these prevailing wind conditions.

Solution mining liquids would consist of a 1% to 2% sodium carbonate solution injected into the target trona unit at a temperature of 150°F to 200°F and at a pressure of 466 to 666 psi (Barr Engineering 2022). Solution mining liquids and brine piping would connect the mine well field to the processing plant and would be configured in pairs: one pipeline to transport injection liquids from the processing plant to the well unit and a second pipeline to transport the mined solution (i.e., brine) back to the processing plant. A mainline pipeline would traverse the approximate center of the mine field, would be collocated with the primary access road, and would serve as the main transport between the processing plant and the mine well field. Smaller injection solution distribution and brine gathering pipelines would branch off from this mainline pipeline to individual well units. Depending on location in the mine well field, the injection and gathering pipelines would vary in size and would range in size from approximately 28 inches for the mainline pipeline to 4 inches in diameter for the distribution/gathering pipelines. Operating pressures would be such that any leak in the piping system would have the potential to aurally distribute the mining solution or brine liquid over a large area around the leak point. Additionally, aerial distribution of sodium carbonate, either in liquid form or as particulate matter, from the brine storage pond is possible given the pond location and prevailing wind direction.

3.15.2 Environmental Consequences

3.15.2.1 Analysis Method

Impacts to human health and safety can occur during all phases of Project construction, operations, and decommissioning. A Project health and safety plan would be developed and implemented to ensure protection of human health and safety during all phases of the Project and compliance with applicable

regulations; however, consideration of potential impacts to human health and safety from solution mining and refining operations is of paramount importance due to the length of the operational life of the proposed mine.

The impact indicators for human health and safety and hazardous materials include the number of public access roadways that intersect or come in proximity to Project components that have the potential to emit sodium carbonate particulates or mining solution/brine.

The following assumptions were used in this analysis:

- Impacts to human health and safety are directly related to exposure to sodium carbonate particles and/or sodium carbonate-containing liquids.
- The particle size of the refined sodium carbonate mineral ranges from 75 µm (0.00295276 inch) for light sodium carbonate up to 600 µm (0.023622 inch) for dense sodium carbonate and is such that sodium carbonate particulate matter could be aerially dispersed under windy conditions in excess of 5 miles per hour (4.5 m per second) (Southand 2023).
- Mining solution and recovery brine liquids pipelines would be installed on the surface, except when crossing roads; therefore, sodium carbonate-containing liquids could be aerially dispersed through small leaks in the pipelines at the proposed maximum operating pressure of 266 psi and under windy conditions more than 5 miles per hour (4.5 m per second).
- Impacts to human health and safety associated with construction and decommissioning of the Project's surface components (i.e., refinery, co-generation facility, storage pond, surge pond, sanitary wastewater pond, injection and recovery pipelines, well pads/well fields, rail car loading facility and railroad spur line, 230-kV transmission line, natural gas line, water line, landfill, and internal/external roads) are not included in the analysis because human health and safety concerns and hazardous materials generation would be greater during the operational life (24 years) of the mine.

3.15.2.2 *Alternative A (No Action)*

Under the No Action Alternative, no additional expansion onto BLM- or USFS-administered lands would occur. No solution mining would occur, and there would be no changes or alterations to the landscape; therefore, there would be no impacts to human health and safety from solution mining activities and/or hazardous materials generation. Existing conditions and trends in the analysis area would continue.

3.15.2.3 *Alternative B (Proposed Action)*

Impacts to human health and safety would be affected by potential human exposure to sodium carbonate particles and/or mining solution and brine liquids from de minimis discharges and/or spills or leaks from the proposed mine surface infrastructure components, including the rail car loading facility; railroad transportation system; refinery; solution mining and recovery pipelines, pump stations, and well pads; and surge pond and storage ponds.

Sodium carbonate is classified as an irritant and exposure to airborne particulates and/or solution mining liquids and brine through the following routes could result in the indicated impacts to human health and safety:

- Ingestion (oral route): Could cause a burning sensation in the mouth; irritation of the lips, mouth, tongue and pharynx; esophageal and abdominal pain; vomiting; and nose bleeds.

- Inhalation: Inhalation of dusts/mists may cause irritation of the upper respiratory tract with sore throat, coughing and shortness of breath; and may cause severe irritation of the respiratory tract with coughing, choking, pain, and irritation of the mucous membranes.
- Dermal contact: Prolonged contact with wet material or by moist skin may cause irritation, with the effects dependent upon concentration and duration of exposure. Dermatitis or effects similar to those for acute exposure may occur.
- Eye contact: Dust or mist may cause severe irritation, redness, lachrymation, or swelling of tissue; the full extent of the injury may not be immediately apparent.

Under Alternative B, large areas of BLM-administered lands intermingled with state, private, and other federal surface lands within the KFO and the RFO would be crossed by the proposed railroad spur line. Within the proposed Project footprint, surface components consisting of the rail car loading facility and railroad in Section 28, the storage pond in Section 22, and the proposed solution mining operations in Sections 24 and 26 would be on BLM-administered lands; the refinery, co-generation facility, and surge pond, would be located on privately owned lands in Section 27; and the proposed solution mining operations would be on privately owned lands in Sections 23, 25, and 35.

Direct access to the rail car loading and railroad transportation system and the mine well fields in Sections 23, 24, 25, 26, and 35 is afforded through public access roadways that traverse BLM-administered lands and lands owned or managed by private, state, or other federal agencies. When these public access roadways cross linear infrastructure elements (e.g., railroad spur line), risks to human health and safety increase at those crossing points compared to other locations. Although soda ash is not considered a Resource Conservation and Recovery Act hazardous waste if discarded in its purchased form, its waste classification could change if its characteristics are changed during spill recovery and cleanup operations. Additionally, soda ash is classified as an irritant that can have human health and safety impacts from inhalation, ingestion, or contact with the skin or eyes.

Several public access roadways intersect or are in proximity to the surface infrastructure components that contain sodium carbonate, as summarized in Table 3.15-1.

Table 3.15-1. Alternative B Public Access Roadways and Surface Component Intersections

Impact-Causing Element – Public Access Roadways	Number
Railroad crossings	8
Rail car loading facility and storage area crossings	2
Processing facility area	0
Mine well field	0
Section 24	3
Section 26	2

In addition to railroad/roadway crossings, public access to the solution mining surface components raises the possibility of aerial exposure to either sodium carbonate particulates and/or sodium carbonate-containing mists and/or liquids.

3.15.2.4 *Alternative C*

Alternative C is the same as Alternative B, except for the location and length of the 230-kV transmission line and the location and length of the beginning point for the Northern Mine Access Road. Under

Alternative C, the 230-kV transmission line would be approximately 23.07 miles long versus 16.95 miles long under Alternative B, for total disturbance areas of 280.53 acres and 205.63 acres, respectively. Under Alternative C, the mine access road beginning point would be on the south side of an existing interchange of I 80, approximately 3 miles to the west of the proposed railroad, whereas under Alternative B, the proposed beginning point would be on the north side of I 80 and less than 0.25 mile to the east of the proposed railroad route. The Alternative C beginning point would use an existing graveled roadway, whereas the Alternative B beginning point would leave from a paved roadway but would entail construction of approximately 0.68 mile of new roadway. In total, the Northern Mine Access Road would be approximately 18.53 miles long and disturb 67.40 acres under Alternative C, compared to a length of approximately 16.11 miles and a total disturbance of 58.60 acres under Alternative B.

3.15.2.5 *Alternative D (Preferred Alternative)*

Under Alternative D, the mine site boundary would be smaller at 4,644.05 acres versus 4,980.76 acres under Alternatives B and C. The lengths of the mine access road, natural gas pipeline, and water supply pipeline would also be less than under Alternatives B and C, and the transmission line would be a length in between the other two alternatives.

Under Alternative D, the mine site would include a low total alkalinity pond, solution mining pump station, stormwater pond, landfill, and solution mining operations on BLM-administered lands in Sections 22, 24, and 26 of T16N, R109W. The trona processing facility (i.e., refinery, co-generation facility, surge pond, landfill, stormwater pond, and rail car loading facility) would be on BLM-administered lands in Sections 4, 6, and 8 and privately owned lands in Sections 5, 7, and 9 T18N, R108W. Low total alkalinity recovered brine would be transported from the mine site to the processing facility via a buried pipeline through BLM-administered lands in Sections 4 and 16 of T16N, R110W; Sections 2, 11, 23, and 34 of T17N, R110W; and Sections 10, 12, 18 of T18N, R109W; with input to the refinery in Section 8 of T18N, R109W.

Under Alternative D, the railroad spur line to transport refined soda ash would be eliminated thereby reducing the number of public access roadway/railroad intersections/crossings, and roadway access to the rail car loading facility would also be eliminated. However, public roadway access to the processing facility area would increase, whereas access to surface components within the mine site on BLM-administered lands in Sections 22, 24, and 26 of T16N, R110W would remain the same as Alternatives B and C, as summarized in Table 3.15-2.

Table 3.15-2. Alternative D Public Access Roadways and Surface Component Intersections

Impact-Causing Element – Public Access Roadways	Number
Railroad crossings	0
Rail car loading facility and storage area crossings	0
Processing facility area	3
Mine well field	0
Section 24	3
Section 26	2

3.15.2.6 *Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity*

Irretrievable impacts to human health and safety from the Project would be associated with exposure to sodium carbonate particulate matter and/or solution mining and recovered brine mists through aerial distribution at the soda ash refinery, rail car loading facility, railroad transportation system, storage and surge ponds, and the solution mining and brine recovery infrastructure (e.g., well pad piping and, mining solution/recovered brine pipelines) at the mine well fields. Additionally, irretrievable impacts to human health and safety would be from contact with affected environment soils that have been exposed to solid or liquid releases from the aforementioned solution mining components.

Irreversible impacts to human health and safety of the mine site workers are unlikely because the workers would employ appropriate personal protective equipment per the mine's health and safety plan. Further, irreversible impacts to human health and safety of the public are unlikely because public access to the mine site solution mining components would be restricted and the potential for exposure to soda ash particulates at public roadway crossings of the railroad transportation system would be governed by the frequency of rail shipments and public vehicle encounters, which would be extremely low. Finally, decommissioning of the mine site would entail reclamation to return the land to pre-disturbance conditions, which would remove legacy accumulations of soda ash in affected area soils.

Irretrievable and irreversible impacts from hazardous materials to mine site workers and the public would be negligible because the use of hazardous materials and/or the generation of hazardous wastes would be minimized during construction, operations, and decommissioning, and because the handling, storage, and disposal of hazardous materials, hazardous wastes, petroleum products, and solid wastes would be in conformance with federal and state permit requirements.

3.15.2.7 *Cumulative Impacts*

Human health and safety and hazardous materials cumulative impacts from past and present actions are associated with the exploration and development of oil and natural gas resources within the affected environment. Development of oil and natural gas resources in Sweetwater County has occurred from 1978 to the present day, with the drilling and completion of a total of 4,771 wells through May 2023 (www.mineralanswers.com/wyoming/sweetwater-county). However, the location of the railroad transportation line, northern access road, and the mine site itself would be outside the areas with the most oil and gas development, whereas two oil and gas well pads would be within the mine site boundary. Additionally, the railroad transportation line would cross five natural gas pipelines and three hazardous liquids pipelines (National Pipeline Mapping System), but no reported spills/releases have occurred in proximity to the location of the railroad transportation line or the mine site boundary and thus, cumulative impacts from these past actions are negligible or nonexistent.

The Rock Springs RMP (BLM 2024c) and the Kemmerer RMP (BLM 2008a) allow for development of sodium carbonate resources (trona) for both short- and long-range development in an orderly and timely manner. The KSLA is open to exploration and consideration for leasing and development but is closed to prospecting permits. Trona leasing would be considered on a case-by case basis and is subject to the same conditional requirements as oil and gas and coal resources, and the general management direction applied in Green River and Kemmerer RMPs. Other RFFAs (Appendix E) are predominantly concerned with roadway improvements, fluid transport pipeline extensions, and ADA-compliant trail improvements, structure repair, pavement rehabilitation, and safety improvements. Cumulative impacts from hazardous materials to mine site workers and the public would be negligible because the use of hazardous materials and/or the generation of hazardous wastes would be minimized during construction, operations, and decommissioning, and because the handling, storage, and disposal of hazardous materials, hazardous

wastes, petroleum products, and solid wastes would be in conformance with federal and state permit requirements.

3.16 Lands and Realty

This section analyzes how proposed mine construction, operations, and processing activities would affect land tenure adjustments, such as parcels designated for acquisition, retention, disposal, or withdrawal, and existing and reasonably foreseeable future land use authorizations, such as ROWs, easements, and designated corridors. The analysis relies on existing data from previous environmental assessment–level NEPA documents addressing modifications to the Mine Plan, as well as knowledge of the mine layout and activities.

The analysis area for lands and realty consists of the proposed mine construction, operations, and processing footprints and ROWs for all action alternatives, plus a 250-foot buffer (Appendix Q, Figure 3.16-1). This analysis area has been applied to identify existing ROWs that are within or adjacent to the footprints of each alternative. The 250-foot buffer was applied to capture all existing ROWs that may not directly intersect the Project footprint but are close enough to require notification or coordination during construction activities; the largest ROWs that may be present in this area are 200 feet wide, so 250 feet was deemed appropriate to provide room for mapping error.

3.16.1 Affected Environment

The analysis area is located primarily within the KFO, with a portion occurring within the RSFO. The KFO as a whole is characterized by large contiguous areas of BLM-administered lands intermingled with state, private, and other federal surface lands. Landownership within the analysis area is primarily BLM-administered or private lands, with some state-owned lands and local government properties including the Green River Intergalactic Spaceport and Scott's Bottom Nature Area. A portion of the analysis area is within the Ashley National Forest, which is administered by the USFS. Land use within the analysis area is characterized primarily by shrub/scrub, herbaceous, and undeveloped or barren land that is used for recreation, livestock grazing, power generation, other trona mining, and other industrial uses. Sweetwater County has zoned the majority of the analysis area for mining/industrial use (Barr Engineering 2022).

Land tenure adjustments refer to those actions that result in the retention or disposal of BLM-administered lands or the BLM's acquisition of nonfederal lands or interests in land. One of the overall goals of the land tenure adjustment program is to improve management and protection of high-value public resources through consolidation of federal, state, and private lands. To this end, FLPMA requires that public lands be retained in public ownership unless, as a result of land use planning, such as the RMP process, disposal of certain parcels is determined to best meet the public interest. The analysis area includes one parcel that the KFO has identified for disposal. This parcel is approximately 641 acres and is located due west of the interchange of US 30 and I 80. The BLM has not identified any other parcels for retention, acquisition, or withdrawal in the analysis area (BLM 2010a).

Land use authorizations within the KFO and RSFO include the issuance of FLPMA leases, permits, and easements; ROWs; airport leases; and Recreation and Public Purposes Act leases and conveyances. Land use authorizations for pipelines have the authority under the MLA of 1920. No land use leases, permits, easements, or Recreation and Public Purposes Act leases have been issued within the analysis area (BLM 2010a). Leases related to oil and gas and mineral resources are discussed in Section 3.6.

A ROW grant authorizes rights and privileges for a specific use of BLM-administered lands for a specified period of time appropriate for the life of a project. ROWs are issued for renewable energy generation sites; communications sites; linear infrastructure projects such as roads, railroads, pipelines,

communication cables, and transmission lines; and other similar uses. A total of 126 BLM ROWs and two USFS ROWs have been issued or are pending within the lands and realty analysis area (Table 3.16-1; Appendix Q, Figure 3.16-1).

Table 3.16-1. Summary of Right-of-Way Authorizations Issued within the Lands and Realty Analysis Area

ROW Type	Number within Analysis Area
Oil and gas	34
Roads	33
Communications	28
Transmission	19
Other	6
Water	4
Rail	2
USFS	2 (1 oil and gas, 1 communications)

The Kemmerer RMP has designated preferred utility corridors based on use (i.e., transmission lines, pipelines, and fiber optic lines). A designated high-voltage transmission line corridor intersects the western portion of the analysis area between I 80 and the Town of Granger (Appendix Q, Figure 3.16-1). An interstate pipeline corridor crosses the analysis area southwest of the I 80 and US 30 interchange (Appendix Q, Figure 3.16-1). In addition to the BLM designated corridors, the USFS has also designated a utility corridor along WY 530 within the Ashley National Forest (USFS 2024a). Section 368 of the Energy Policy Act of 2005 (42 USC 15926) directed the U.S. Department of the Interior to establish designated energy corridors (Section 368 corridors) in 11 states, including Wyoming, to identify preferred locations for future oil, gas, and hydrogen pipelines and electricity transmission and distribution projects on federal lands. Three Section 368 corridors are located within the lands and realty analysis area (Segments 55-240, 218-240, and 121-240) (Appendix Q, Figure 3.16-1). These corridors are designated for multimodal use and have a ROW width of 3,500 feet. In addition to Section 368 corridors, the State of Wyoming has implemented the Wyoming Pipeline Corridor Initiative (WPCI), which resulted in the designation of approximately 2,000 miles of corridors across BLM-administered, state, and private lands throughout the state dedicated to oil resources, carbon capture, and other compatible infrastructure (BLM 2021b). One WPCI proposed corridor is present within the lands and realty analysis area and intersects with the water supply pipeline proposed under all alternatives (Appendix Q, Figure 3.16-1).

The number of land use authorizations issued by the KFO and RSFO is expected to increase as future oil and gas, mining, transportation, renewable energy, and communications projects are implemented. Compatible infrastructure projects are encouraged but not required to be routed within Section 368 or WPCI corridors; therefore, some ROWs issued for these project types in the future may occur throughout the KFO- and RSFO-administered lands, but the majority are expected to occur within these corridors.

3.16.2 Environmental Consequences

3.16.2.1 Analysis Method

Impacts include the occupancy of BLM-administered lands by mining activities, fencing/access control, and structures that would preclude or be incompatible with existing or future ROWs, easements, or designated utility corridors, or that would prevent or impede the disposal of lands that the BLM has

identified for disposal. Impacts are also discussed in terms of Project features, including pipelines, roads, transmission lines, utility features, railroads, and other linear features and ROWs that may affect but not necessarily preclude existing and future ROWs or uses. The presence of the Project's linear features may affect planning/routing, construction, and maintenance activities for intersecting ROWs, but those uses could still occur. The indicators used to analyze impacts are the number of existing and proposed ROWs, easements, disposal lands, and utility corridors that intersect the Project area.

This analysis assumes the following:

- In some cases, linear Project elements such as access roads, pipelines, utility features, and other similar features may overlap other ROWs or land use authorizations in a manner that may limit, but does not necessarily preclude, those uses long term.
- Impacts to recreational uses, wildlife access, mineral resources, and livestock grazing are discussed in their respective sections.
- The use of the existing access road that would require no additional improvements would not result in any ground disturbance or expansions of existing road ROWs. Therefore, use of the existing access road is not expected to impact lands and realty and is not included in this analysis.

3.16.2.2 *Alternative A (No Action)*

Under the No Action Alternative, no additional expansion onto BLM- or USFS-administered lands would occur. No ground disturbance would occur, and there would be no changes or alterations to the landscape; therefore, there would be no impacts to lands and realty. Existing conditions and trends in the analysis area would continue.

3.16.2.3 *Alternative B (Proposed Action)*

Proposed Project facilities include processing facilities, a co-generation plant, storage ponds, a landfill, transportation facilities, and utility features. The processing facilities, co-generation plant, storage ponds, and landfill are proposed for location in Section 27, T16N, R110W. Project-related transportation and utility features consist of a water supply pipeline, rail line, access road, overhead transmission line, and natural gas pipeline. These infrastructure features would cross a combination of private lands, USFS-administered lands, and BLM-administered lands in T16 to 19N and Ranges 107 to 111W, 6th Principal Meridian. Alternative B (including all facilities, mining infrastructure, ancillary facilities, and transportation and utility features) would collectively disturb approximately 3,369 acres of private land, 2,947 acres of BLM-administered lands, and 9 acres administered by the USFS. Impacts to USFS-administered lands within the Ashley National Forest would include permanent and temporary ROWs as a result of construction of the water pipeline. Aside from BLM- and USFS-administered lands, no additional federal or state-administered lands would be disturbed under Alternative B. Construction activities would occur adjacent to lands owned by the City of Green River; however, no direct disturbance would occur. Under Alternative B, the Applicant would apply for ROW grants, special use permits, and/or easements from the BLM, USFS, the State of Wyoming, and private landowners for authorization to construct, operate, and decommission the utilities and ancillary facilities. Impacts to private lands may include private land leases or easements that would allow surface use and would be negotiated with the landowner. Communication is ongoing with the private landowners for easements for the linear features that would be finalized upon confirmation of alignments (Barr Engineering 2022).

Table 3.16-2 below identifies the anticipated additional permanent and temporary BLM ROWs outside Pacific Soda's existing lease area for Alternative B. The Applicant is requesting a long-term ROW for 75 years to accommodate the infrastructure facilities on BLM-administered lands for the duration of mine operations.

Table 3.16-2. Bureau of Land Management Right-of-Way Requirements under Alternative B

Facility	Permanent ROW Width (feet)	Permanent ROW Area (acres)	Temporary ROW Width (feet)	Temporary ROW Area (acres)
Rail line and access road	350	953.29	Varies	69.37
Water pipeline	60	179.31	15 (typical)	67.82
Transmission line*	100	205.63	N/A	N/A
Mine site access road	30	58.6	N/A	N/A
Natural gas pipeline*	60	24.16	N/A	N/A
Total		1,420.99		137.19

Source: Barr Engineering (2022).

Note: N/A = not applicable.

* To be requested and permitted by the Applicant and constructed, operated, and decommissioned by others.

A total of 86 existing or pending BLM ROWs would be within the Alternative B Project footprint, including 25 oil and gas ROWs, 24 roads, 19 communications sites or facilities, 10 transmission lines, three water ROWs, and five other ROWs. Under Alternative B, the proposed water pipeline and access road would cross the Ashley National Forest within the existing designated utility corridor. The proposed water pipeline and access road would intersect with a WPCI-designated corridor near the City of Green River. Portions of the Project area and the proposed rail line and access road would occur within a designated intrastate pipeline corridor. The proposed rail line and access road would also intersect with a high-voltage corridor. The presence of the Project would not require any existing ROWs to be vacated or jeopardize the rights of existing ROW holders. During construction of the Project, construction activities within existing roadway and infrastructure ROWs and designated corridors may result in delays or interruptions of Project operations. However, a traffic study would be conducted and a traffic and transportation management plan would be developed in consultation with relevant roadway agencies, such as WYDOT, the engineering division for the City of Green River, and the Sweetwater County Road and Bridge Department. The traffic and transportation management plan would include BMPs to limit the impacts of Project construction vehicles on existing ROWs. The Applicant would employ BMPs to avoid and minimize impacts to existing oil and gas, communications, water, and electrical infrastructure within these ROWs and designated corridors. Therefore, no impacts to existing land use authorizations would occur.

The presence of Project facilities and infrastructure would likely preclude potential future mine well fields, oil and gas facilities, and other nonlinear ROWs. Proponents of these activities would be required to select sites that avoid and accommodate Project infrastructure, potentially requiring long reroutes and/or placement in areas that are more difficult or costly to develop. The Project would not necessarily preclude future linear ROWs in these areas, although future linear projects may be subject to some additional coordination, siting considerations, and construction BMPs to avoid Project facilities and infrastructure. The increased siting, design, and mitigation considerations would increase the costs, level of effort, and time to design and construct these future projects, which may be schedule- or cost-prohibitive for some Project proponents.

Under Alternative B, the proposed rail line would intersect the 641-acre parcel identified for disposal west of the interchange of US 30 and I 80. Although the BLM would not be expressly prohibited from disposing of the parcel following issuance of the ROW, the presence of a rail line ROW and other Project features may affect the parcel's desirability for potential buyers. Potential buyers would still be free to submit proposals for a sale with the understanding that the parcel is encumbered with an existing ROW. After the sale, the Applicant would need to negotiate new terms and conditions of the ROW with the new landowner to ensure the Project's continued operation. The presence of the rail line ROW on the parcel

would therefore affect its potential disposal, which could affect the BLM’s ability to effectively manage and consolidate public lands and acquire new properties.

3.16.2.4 *Alternative C*

Similar to Alternative B, the Applicant would apply for ROW grants and/or easements from the BLM, USFS, the State of Wyoming, and private landowners. Table 3.16-3 below identifies the anticipated additional permanent and temporary BLM ROWs outside Pacific Soda’s existing lease area for Alternative C. The Applicant is requesting a long-term ROW for 75 years to accommodate the infrastructure facilities on BLM-administered lands for the duration of mine operations.

Table 3.16-3. Bureau of Land Management Right-of-Way Requirements under Alternative C

Facility	Permanent ROW Width (feet)	Permanent ROW Area (acres)	Temporary ROW Width (feet)	Temporary ROW Area (acres)
Rail line and access road	350	953.29	Varies	47.08
Water pipeline	60	179.31	15 (typical)	67.82
Transmission line*	100	280.53	N/A	N/A
Mine site access road	30	67.4	N/A	N/A
Natural gas pipeline*	60	24.16	N/A	N/A
Total		1,504.69		114.90

Source: Barr Engineering (2022).

Note: N/A = not applicable.

* To be requested and permitted by the Applicant and constructed, operated, and decommissioned by others.

A total of 97 existing or pending ROWs would be within the Alternative C Project footprint, including 27 roads, 26 oil and gas ROWs, 24 communications sites or facilities, 12 transmission lines, three water ROWs, and five other ROWs. Alternative C overlaps the same designated corridors as Alternative B. As discussed under Alternative B, no impacts to these existing ROWs and corridors would occur. Alternative C would also result in the same impact to the 641-acre parcel identified for disposal as described under Alternative B.

3.16.2.5 *Alternative D (Preferred Alternative)*

Alternative D (including all facilities, mining infrastructure, ancillary facilities, and transportation and utility features) would collectively disturb approximately 3,594 acres of private land, 3,329 acres of BLM-administered lands, and 93 acres of state-administered land. Alternative D has been designed to avoid crossing Bureau of Reclamation–administered lands in Section 2 (BLM 2022b). Similar to Alternative B, the Applicant would apply for ROW grants and/or easements from the BLM, the State of Wyoming, and private landowners. Impacts to private lands would occur in the form of private land leases or easements for the linear features that would need to be negotiated with the landowners upon confirmation of alignments (Barr Engineering 2022).

Table 3.16-4 identifies the anticipated permanent and temporary BLM ROWs outside the existing lease area for Alternative D.

Table 3.16-4. Bureau of Land Management Right-of-Way Requirements under Alternative D

Facility	Permanent ROW Area (acres)	Temporary ROW Area (acres)
Brine/condensate pipelines	255.89	258.49
Mine site access road	100.68	67.19
Mine site transmission line	273.25	218.60
Natural gas pipeline	26.06	13.09
Processing facilities access road	13.91	9.27
Processing facilities boundary	1,109.19	N/A
Processing facilities landfill access road	1.82	2.77
Processing facilities transmission line	6.80	5.44
Water intake access road	5.35	5.34
Water intake transmission line	162.74	N/A
Water supply pipeline	30.60	61.32
Total	1,986.29	641.51

Source: Barr Engineering (2023).

Note: N/A = not applicable.

Alternative D would require more acres of both permanent and temporary ROWs on BLM-administered lands compared to Alternative B. Unlike Alternative B, the processing facilities would be located outside the mine permit boundary. No new additional ROWs would be required for the rail line.

A total of 67 existing or pending ROWs would be within the Alternative D Project footprint, including 17 oil and gas ROWs, 16 communications sites or facilities, 12 roads, 12 transmission lines, two rail lines, two water ROWs, and six other ROWs. Under Alternative D, the proposed water line and transmission line would intersect with a Section 368 corridor in one location immediately south of I 80. The proposed water pipeline and access road would also intersect with a WPCI-designated corridor north of the intersection of I 80 and La Barge Road. As discussed under Alternative B, no impacts to these existing ROWs and corridors would occur.

No parcels identified for disposal would be affected under Alternative D.

3.16.2.6 Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity

No irreversible impacts to lands and realty would occur as a result of the Project because all Project-related disturbance would be reclaimed to preconstruction conditions following decommissioning. Irretrievable impacts to lands and realty would be expected for the duration of the Project for the areas in which the physical occupation of the mining facilities, water and transmission lines, rail line, and access roads would potentially preclude other activities; these impacts would occur for the life of the Project until decommissioning. The Project represents a short-term use of resources that would not affect the long-term productivity of land use authorizations and land tenure adjustments, as other land use authorizations and encumbrances would again be permitted in the Project area following decommissioning and reclamation, as allowed under the applicable RMPs.

3.16.2.7 Cumulative Impacts

The RFFAs identified in Appendix E would result in approximately 43,603 acres of total disturbance, some of which would require land use authorizations and ROW grants on BLM-administered lands. Nine of the projects in Appendix E (West Soda Ash; American Soda Solution Mining Expansion; Sweetwater Carbon Storage Hub; Pore Space; Green River to Buckboard Fiber Optic; Skyline ADA Trail; Wilkins Peak Mountain Bike Trail Expansion; Tate Museum; and 4-stall RV Station) could result in a need for a BLM ROW. At this time, it is not possible to determine the exact portions of these projects that would take place on BLM-administered lands and thus require authorizations and ROWs; therefore, this analysis takes a conservative approach by assuming that any of these eight projects could take place exclusively on BLM-administered lands and would thus require BLM authorization for the entire limit of disturbance of approximately 43,279 acres.

The Proposed Action would require 1,421 acres of new long-term ROWs, which, when combined with the eight RFFA projects that could occur on BLM-administered lands, would result in up to 44,700 acres of potential ROW authorizations required on BLM-administered lands (though the associated initial and long-term surface disturbance would be limited to a much smaller area within the ROW grant areas). The Proposed Action combined with these RFFAs would also contribute incrementally to the additional siting, design, schedule, cost, and construction considerations for potential future projects that would need to avoid these Project areas.

Existing land use authorizations within the analysis area for cumulative impacts would not be directly impacted because the Proposed Action and all other RFFAs would be implemented in accordance with the applicable RMPs; however, the presence of these existing land use authorizations would require additional planning and effort on the part of the BLM lands and realty program to coordinate with existing ROW holders. The Proposed Action intersects a 641-acre parcel identified for disposal, which would potentially affect the BLM's ability to dispose of the parcel. If any of these RFFAs overlap with this parcel or with any other parcels that BLM has identified for disposal, the Proposed Action combined with these other RFFAs would cumulatively affect the BLM's ability to effectively manage and consolidate public lands and acquire new properties.

3.17 Recreation

This section analyzes how proposed mine construction, operations, and decommissioning activities would affect recreation, as an activity and resource, involving a broad spectrum of pursuits and levels of management, ranging from dispersed and casual recreation to permitted organized group uses. The analysis relies on existing data from the Mine Plan.

The analysis area for recreation includes a 5-mile buffer around the Project area and Project components for all the action alternatives (Alternatives B, C, and D) (Appendix Q, Figure 3.17-1). This buffer is considered an appropriate geographic extent for potential recreational setting, opportunity, and experience impacts as visitors within this area may experience direct or indirect changes to their desired recreational outcomes due to the Project.

3.17.1 Affected Environment

Recreation in the analysis area is predominantly administered by the BLM and USFS, though there are also sections of state, local government, and privately owned lands. Landownership is checkerboarded throughout the analysis area, so there are multiple instances where dispersed recreation is co-administered by several landowners. Federally designated lands available for dispersed recreation include the KFO Extensive Recreation Management Area (ERMA), RSFO ERMA, the Green River Special Recreation

Management Area (SRMA), and USFS general and destination recreation management areas (USFS 2024b) and lands categorized according to the Recreation Opportunity Spectrum in the USFS-managed Flaming Gorge NRA.

The majority of public lands in the analysis area are known for undeveloped areas and remoteness, which provide a variety of dispersed recreational opportunities for users who wish to experience primitive and undeveloped recreation. The most popular dispersed recreation opportunities in the analysis area include off-highway vehicle (OHV) use and hunting, though other recreational opportunities include mountain biking, camping, hiking, photography, sightseeing, touring, and wildlife viewing.

Designated or developed recreation sites within the analysis area include the Flaming Gorge NRA, the developed Wilkins Peak Mountain Bike Trail System, the Overland Historic Trail, four NHTs (California NHT, Mormon Pioneer NHT, Oregon Pioneer NHT, and Pony Express Pioneer NHT), and the Flaming Gorge-Green River Basin Scenic Byway.

While primitive recreation settings do occur in remote areas of the analysis area, there are no designated wild and scenic rivers, wilderness areas, wilderness study areas, lands with wilderness characteristics, areas of critical environmental concern, or national monuments within the analysis area.

Table 3.17-1 below provides the total acreage (or distance in miles) of these designated recreation areas, sites, and trails within the analysis area.

Table 3.17-1. Designated Recreation Areas, Sites, and Trails within the Analysis Area

Recreation Opportunities	Administering Agency	Analysis Area
Designated or Developed Sites		
Flaming Gorge NRA (Ashley National Forest)	USFS	21,385 acres
Wilkins Peak Mountain Bike Trail System	BLM / USFS / City of Green River	26.60 miles
Overland Historic Trail	BLM	23.12 miles
National Historic Trails		
Mormon Pioneer NHT	NPS / BLM	12.56 miles
California NHT	NPS / BLM	27.16 miles
Oregon Pioneer NHT	NPS / BLM	12.56 miles
Pony Express Pioneer NHT	NPS / BLM	13.26 miles
Scenic Byways		
Flaming Gorge-Green River Basin Scenic Byway	WYDOT	24.32 miles
Designated Areas		
Kemmerer Field Office ERMA	BLM	120,497 acres
Rock Springs Field Office ERMA	BLM	54,907 acres
Green River SRMA	BLM	437 acres

3.17.1.1 Designated or Developed Recreation Areas

Flaming Gorge National Recreation Area

Approximately 21,385 acres of the Flaming Gorge NRA (Ashley National Forest) are within the analysis area, specifically in the eastern portion west of Flaming Gorge Reservoir. The Flaming Gorge NRA was

established by Congress in 1968 for the purpose of the Colorado River storage project and for public outdoor recreation and enjoyment of the Flaming Gorge Reservoir and surrounding lands in Utah and Wyoming.

The Flaming Gorge NRA covers 207,363 acres and includes 91 water miles, encompassing the 42,020-acre reservoir. The NRA is most known for its scenery, geology, and recreation opportunities. The recreation opportunities include fishing, swimming, boating, camping, picnicking, biking, hiking, and ice fishing on the Flaming Gorge Reservoir and the Green River, which attract visitors from across the United States. Overall, the NRA has the greatest development of recreation facilities in the Ashley National Forest. These facilities support water- and road-based recreation opportunities.

Management within the Flaming Gorge NRA is focused on providing public outdoor recreation opportunities and the conservation of scenic, scientific, historical, and other values contributing to public enjoyment (USFS 2024b). Additional management objectives promote compatible uses that do not significantly impair the purposes for which the Flaming Gorge NRA was established. These objectives include providing sanitation needs for boaters and other water-oriented recreation users, maintaining open spaces and undeveloped areas, and managing forested stands for diverse and continuous tree cover that provide recreation, wildlife, and esthetic benefits. The NRA is managed in collaboration with the Bureau of Reclamation, state wildlife and outdoor recreation agencies, and State and Tribal Historic Preservation Offices to maintain and identify unique habitat, historic sites, and recreation opportunities.

Mountain Bike Trail System

The Wilkins Peak Mountain Bike Trail system is a 26.6-mile network of mountain bike trails located within and adjacent to the City of Green River. This network consists of multiple trails including the Wilkins Peak Mountain Bike Trailhead, Pick Your Poison Trailhead, Greenbelt Trail system, and multiple private trails (City of Green River 2019). While these trails are all connected, they are not all administered by the same land management agency. The trail system was developed in cooperation with the BLM, the USFS, the City of Green River, and private landowners to provide fee-free mountain bike trails close to the city center using existing routes (BLM 2023a).

Historic Trails

According to the Rock Springs RMP, the Overland Historic Trail crosses the northernmost edge of the analysis area near Bryan, Wyoming. Management of historic trails that are eligible for the NRHP but are not congressionally designated would generally be the same as for designated trails (BLM). Trail corridor widths have not been designated for the Overland Historic Trail.

In the wake of the California gold rush, traffic by Euro-Americans along the Oregon/California/Mormon Pioneer Trail grew dramatically for 3 years, then leveled out in the 1850s across what is now central Wyoming. The Overland Historic Trail was the old fur-trade route up the North Platte and Sweetwater Rivers to South Pass, after which the routes divided according to a traveler's destination: California, Oregon, or Utah.

The increased traffic brought increasing resistance from Tribal people whose lives and lands were affected by the trail, which heavily damaged their economies and cultures. In the late 1850s, gold strikes on the Front Range in what is now Colorado brought a new flood of pioneers and more conflict. To deal with these conflicts, to meet demands for new transcontinental routes into and out of Colorado, and to bolster its campaign to reassert federal power in Utah, the U.S. Army developed a shorter route west. It ran across what is now southern Wyoming and is currently known as the Overland Historic Trail.

National Historic Trails

Four NHTs cross the analysis area near Granger, Wyoming (Mormon Pioneer, Oregon, California, and Pony Express), all of which are administered by the NPS under the 1999 Comprehensive Management and Use Plan (NPS 1999). However, the BLM manages the NHTs and NHT candidates where they intersect BLM-administered lands. These trails are partially collocated and can overlap in certain segments, with all four trails existing in the same segment at times (NPS 2023).

California National Historic Trail

Approximately 27 miles of the California NHT crosses the analysis area near Granger, Wyoming. The road to California carried more than 250,000 gold-seekers and farmers to California during the 1840s and 1850s—the greatest mass migration in American history. More than 1,000 miles of trail ruts and traces can still be seen in the vast undeveloped west—reminders of the sacrifices, struggles, and triumphs of early American travelers and settlers.

Mormon Pioneer National Historic Trail

Approximately 13 miles of the Mormon Pioneer NHT crosses the analysis area near Granger, Wyoming. Led by Brigham Young, roughly 70,000 members of The Church of Jesus Christ of Latter-day Saints traveled along the Mormon Trail from 1846 to 1869 to escape religious persecution. The Pioneer Company of 1846–1847 established a route from Nauvoo, Illinois, to Salt Lake City, Utah, covering approximately 1,300 miles that would include the construction of new ferries and bridges and the placement of markers for others to follow (NPS 2023).

Oregon National Historic Trail

Approximately 13 miles of the Oregon NHT crosses the analysis area near Granger, Wyoming. As the harbinger of America’s westward expansion, the Oregon Trail was the pathway to the Pacific for fur traders, gold seekers, missionaries, and others. Today, more than 2,000 miles of trail ruts and traces can still be seen in the vast undeveloped western lands—reminders of the sacrifices, struggles, and triumphs of early American travelers and settlers.

Pony Express National Historic Trail

Approximately 13 miles of the Pony Express NHT crosses the analysis area near Granger, Wyoming. The Pony Express NHT was used by young men on fast horses to carry the nation’s mail from Missouri to California in the unprecedented time of only 10 days. The relay system became the nation’s most direct and practical means of east-west communications before the telegraph, and it played a vital role in aligning California with the Union in the years just before the Civil War.

Flaming Gorge-Green River Basin Scenic Byway

One Wyoming scenic byway—the Flaming Gorge-Green River Basin Scenic Byway—traverses through the eastern portion of the analysis area. The scenic byway is a 150-mile drive along the eastern edge of the Uinta Mountains and along the southern rim of the Flaming Gorge Reservoir, providing outstanding views of the river gorge and the High Uintas, as well as roadside geology lessons.

3.17.1.2 *Dispersed Recreation*

The KFO and the RSFO are known for their undeveloped areas and remoteness, which provide a variety of recreational opportunities for users who wish to experience undeveloped recreation. Remote recreation

opportunities are also available on USFS, state, and local lands where permitted (Wyoming Department of State Parks and Cultural Resources 2019).

Dispersed recreation occurring within the analysis area primarily consists of OHV driving, hunting, sight-seeing, hiking, wildlife viewing, horseback riding, camping, backpacking, mountain biking, geocaching, rock-hounding, picnicking, night-sky viewing, and photography. Access to public lands for these dispersed recreation opportunities is possible due to the availability of public and private-permission roads.

Generally, due to the topography and limited access to the proposed mine site, there is low dispersed recreation use in the analysis area. Although these lands are technically available to dispersed recreation, lands within the analysis area are not seen as attractive to many recreators as there are better-suited lands in the surrounding areas. The most common dispersed recreation activities to occur in the area consist of OHV use and hunting.

Bureau of Land Management Recreation Management Areas

Public federal lands administered by the BLM for recreation are either designated as a SRMA or an ERMA. SRMAs prioritize recreation during management and possess more guidelines and restrictions to ensure that management objectives are met. Within the KFO and RSFO, all BLM-administered lands outside of SRMAs are designated as ERMA where recreation is non-specialized, dispersed, and requires less active management.

Management objectives within the RSFO ERMA include ensuring the continued availability of outdoor recreational opportunities while protecting other resources, meeting the legal requirements for the health and safety of visitors, and mitigating conflicts between recreation and other types of resource uses. Management actions relevant to the analysis area include specific management for recreation values on the Green River, Sweetwater River, Big Sandy River, and the Bitter Creek segment between the towns of Rock Springs and Green River.

The Green River SRMA is an approximately 534-acre designated area within the RSFO and the recreation analysis area. The SRMA comprises disconnected sections along the Green River, from the Rolling Green Country Club approximately 3.69 miles northwest of the City of Green River to a section approximately 1 mile southeast of the center of town. Management of the SRMA emphasizes enhancing recreation opportunities and focusing on managing areas with high recreation values or areas where there are conflicts between recreation and other uses (BLM 1997).

U.S. Forest Service Recreation Management Areas

The USFS manages both general and destination recreation management areas and lands categorized according to the Recreation Opportunity Spectrum in the USFS-managed Flaming Gorge NRA (USFS 2024b), including a general recreation management area and a roaded natural Recreation Opportunity Setting. General recreation areas are “where the concept of multiple use is most evident” (USFS 2024b). Small pockets of concentrated use may exist, but these do not dominate the landscape. Desired conditions for the roaded natural Recreation Opportunity Setting include a natural appearing setting with nodes and corridors of development that support higher concentrations of use, user comfort, and social interaction (USFS 2024b). The road system is well defined, plowed in winter, and amenities are strategically placed at destination points or portals to adjacent backcountry settings.

Off-Highway Vehicles

Accessibility is essential for public recreational opportunities to function. Public routes and areas were designated during the planning process via transportation management plans and fall within three management categories according to BLM regulations:

- **Open:** An area where all types of vehicle uses are permitted at all times. This designation refers to cross-country travel both on- and off-road.
- **Limited:** Areas where vehicle use is restricted at certain times, areas, and/or to certain vehicular uses to meet specific resource management objectives. These limitations may include the number or types of vehicles; the time or season of use; permitted, administrative, or licensed use only; use of existing roads and trails; and use only on designated roads and trails.
- **Closed:** Motorized vehicles are permanently or temporarily prohibited. The use of motorized vehicles in closed areas may be allowed for certain reasons; such use is only allowed with the approval of the BLM Authorized Officer.

All areas on BLM-administered lands within the analysis area that are permitted for OHV use are categorized as limited, with no lands designated as open or closed. There are 3,325 acres in the Project area and 180,401 acres in the analysis area.

OHV use on USFS lands is restricted to those roads and trails that are designated as open for such use on the USFS Motorized Vehicle Use Map (MVUM). The USFS portion of the Project area includes two roads off WY 530 (USFS Roads 063 and 081) that are open to OHV travel.

Hunting

Big-game, trophy-game, small-game, and upland bird hunting are all common in and surrounding the Project area (WGFD 2017a). The WGFD classifies and manages wildlife hunting areas according to species. This method allows for different species hunt areas to vary in location and overlap each other at times. The Project area is located within 18 total big game hunt areas: four antelope (pronghorn), five elk, four moose, and five mule deer (WGFD 2022a–d). Refer to Table 3.17-2 for more information on the hunt areas.

Hunting is permitted year-round, though most big game hunting occurs in the fall. Hunter opportunity throughout the analysis area varies by species, license availability, weapon, and hunt area. Hunters include Sweetwater County residents, Wyoming residents, and non-residents (WGFD 2017a).

Table 3.17-2. Big Game Hunt Areas within the Analysis Area

Hunt Area	Size of Hunt Area (acres)	Number of Hunter Days	Hunter Success Rate	Acres of Hunt Unit in Analysis Area (percentage within analysis area)
Antelope 59	353,580	660	88.5%	16,693 (4.7%)
Antelope 94	548,033	2,417	94.6%	36,568 (6.7%)
Antelope 95	857,366	1,457	96.7%	289,100 (33.7%)
Antelope 96	823,875	493	96.2%	79,064 (9.6%)
Elk 30	353,396	1,253	70.0%	16,693 (4.7%)
Elk 100	2,392,610	3,462	78.4%	38,749 (1.6%)
Elk 102	954,334	10,371	36.2%	64,288 (6.7%)

Hunt Area	Size of Hunt Area (acres)	Number of Hunter Days	Hunter Success Rate	Acres of Hunt Unit in Analysis Area (percentage within analysis area)
Elk 105	1,087,110	4,822	23.2%	36,568 (3.4%)
Elk 107	976,396	3,734	27.1%	289,100 (29.6%)
Moose 33	177,703	14	100.0%	17,070 (9.6%)
Moose 35	976,453	72	60.0%	289,100 (29.6%)
Moose 40	975,759	14	100.0%	100,856 (10.3%)
Moose 44	1,475,130	0*	0.0*	16,693 (1.1%)
Mule Deer 102	775,061	1,064	82.8%	16,693 (2.2%)
Mule Deer 131	2,711,010	2,490	30.0%	36,568 (1.4%)
Mule Deer 132	1,079,280	2,960	25.8%	288,147 (26.7%)
Mule Deer 134	800,038	2,125	25.7%	36,568 (4.6%)
Mule Deer 135	1,537,470	10,382	29.7%	64,288 (4.2%)

Source: WGFD (2022a–d).

* No activity reported.

3.17.2 Environmental Consequences

3.17.2.1 Analysis Method

This section analyzes the issue of how the proposed development would impact existing recreational opportunities. Analysis was based on the following issue statement:

- How would the proposed mine construction, operation, and processing activities affect existing recreation opportunities, such as dispersed recreation (hunting, camping, horseback riding, hiking, etc.) or motorized recreation (OHV use, driving for pleasure on public roadways, etc.)?

The indicators used to analyze this issue include 1) the acres of publicly administered lands managed for recreation opportunities that would intersect the analysis area, and 2) the acres/miles of special designations impacted by the Project. The quantitative indicators are combined with a detailed qualitative description of how Project elements would impact recreational experiences (e.g., noise or changes to landscape character).

The analysis relies on existing data and knowledge of Project activities within the analysis area (5-mile buffer of the Project footprint). Spatial data were gathered from the BLM, USFS, and other online resources. These data were overlain with spatial data for the proposed alternatives, and intersecting acreages were calculated using GIS. This analysis focuses on proposed disturbances to areas available for public recreation.

This analysis assumes the following:

- This analysis was completed using the best available information, including state and federal agency information and recreation visitation numbers.
- Recreational activities may occur up to the fence line of the mine permit boundary subject to any applicable Wyoming hunting regulations.

- Visual impacts in the foreground would affect the recreation setting unless existing development is already in the foreground; therefore, new development would not change the visual setting or contrast.

3.17.2.2 *Alternative A (No Action)*

Under the No Action Alternative, no additional expansion onto BLM- or USFS-administered lands would occur. No ground disturbance would occur, and there would be no changes or alterations to the landscape; therefore, there would be no impacts to recreational resources. Existing conditions and trends in the analysis area would continue.

3.17.2.3 *Alternative B (Proposed Action)*

Under Alternative B, 9 acres of the Flaming Gorge NRA would be directly disturbed by the construction of the water pipeline. Construction, maintenance, and decommissioning of the water pipelines and other associated infrastructure would conflict with the management goals of the Flaming Gorge NRA and would permanently decrease the quality of the scenic, natural, and historical settings for recreators. The degradation of land within the NRA from the presence of the water pipeline would continue to adversely impact recreators' ability to experience natural and scenic settings until the Project is decommissioned and the area is reclaimed as practicable. An additional 21,359 acres within the analysis area would have the potential to be indirectly impacted by noise and visual disturbances during construction, with the impacts being greatest adjacent to construction activities and decreasing away from these areas (Table 3.17-3). Refer to Section 3.20 for more information on visual impacts. Noise and increased traffic associated with construction would decrease recreators' ability to experience the scenic, scientific, and historical values of the NRA, with the level of impact depending on their proximity to the activities. The associated indirect noise, visual disturbances, and elevated traffic levels would decrease during operations.

No direct impacts under Alternative B would occur to the Wilkins Peak Mountain Bike Trail system, though 13.9 miles would be exposed to increased noise levels during construction of the water pipeline. The Project would not cross any sections of the trail system, though portions would be subject to construction noise and visual disruptions that could reduce the quality of recreation opportunities available in the short term. The level of disruption to recreators would depend on their proximity to the construction activities and would discontinue upon completion of the Project.

Under Alternative B, the Overland Historic Trail would not be directly impacted, though 23.12 miles of the historic trail within the analysis area would have the potential to be indirectly impacted by mining activities. The Project would not cross any sections of the trail, though portions of the trail would be subject to construction noises and visual disruptions that could reduce the quality of recreation opportunities available in the short term. Noise and visual impacts would decrease the natural and historic setting of the trail, therefore decreasing recreators' ability to experience historical context and authentic opportunities. Noise from heavy equipment and traffic from construction would depend on proximity to the activities and would lessen or cease entirely upon completion of the Project. If Project components are still visible from the trail after construction, then they would continue to degrade visual resources through operations. The indirect impacts from noise would be temporary, but visual impacts would continue until the Project is decommissioned.

Table 3.17-3. Impacts to Recreational Opportunities under Alternative B

Recreational Opportunity	Impact to Project Area	Impact to Analysis Area
Flaming Gorge NRA	9 acres	21,359 acres
Overland Historic Trail	0.0 mile	23.12 miles
NHTs	0.24 mile	62.26 miles
Flaming Gorge-Green River Basin Scenic Byway	0.74 mile	24.32 miles

Source: BLM (2023), USFS (2023).

Under Alternative B, a 0.06-mile segment where California, Mormon Pioneer, Oregon Pioneer, and Pony Express NHTs are collocated would be directly impacted from construction of the rail line, technically totaling a 0.24-mile disturbance to NHTs (Table 3.17-3).

No surface-disturbing activities would be permitted within the avoidance area (0.25 mile or the visual horizon, whichever is closer) of any contributing trail segment, except for areas where previous disturbance has occurred and the trail segment has lost the characteristics that contribute to its NRHP significance. The BLM RSFO and BLM KFO have delineated specific protection zones for historic trails (BLM 1997, 2010a). In addition, blading is not allowed on historic trails except to protect life or property, and historic trails may not be used for industrial access or haul roads. Exceptions, waivers, and modifications to this limitation may be approved through consultation with the BLM RSFO and BLM KFO's future 6280 inventories of trail corridor landscape elements. Therefore, any permanent direct impacts from construction would be limited to areas with existing disturbance and minimal historical characteristics. This disturbance would further decrease the historic setting for recreators in those areas, where their ability to experience insight into the nature and purpose of the NHTs has already been impacted by the existing development. The impact would be present where the rail line would be developed and would remain until the Project is decommissioned. Based on proximity to mining activities on 62.26 miles of these NHTs, recreators would have the potential to experience the same types of indirect impacts as they would on the Overland Historic Trail described above. Additionally, indirect noise and visual impacts from operation of the rail line would continue to disrupt recreator experiences near the line for the life of the Project.

The Flaming Gorge-Green River Scenic Byway would be directly impacted on the 0.74-mile segment of road where the water pipeline would cross WY 530. These segments would be buried in trenches running under the highway and would decrease the scenic natural setting from the visual and noise disturbances created by laydown yards, open pits, and heavy equipment during construction. Other impacts such as temporary closures would decrease the accessibility of the byway and surrounding lands to recreators. These impacts would decrease the scenic setting of the byway and by extension recreators' ability to enjoy the scenic values, though impacts would be temporary as the pipeline would be buried, and the disturbed area would be reclaimed to the extent practicable. An additional 24.32 miles of the scenic byway would have the potential for indirect impacts from mining-related increases in traffic (including large trucks) on WY 530 (the Flaming Gorge Scenic Byway) during construction and delivery of heavy equipment. This additional activity would change the experience for visitors driving on the scenic road, and it would affect visitor safety when visitors encounter these activities. Major deliveries would increase heavy-truck traffic and would contribute to increased traffic noise and intermittent slowdowns on this scenic portion of WY 530. The recreation experience for those visitors and locals who currently use WY 530 and the Flaming Gorge Scenic Byway would change due to the increase in large truck traffic.

Under Alternative B, 2,946 acres would become unavailable for dispersed recreational activities such as motorized recreation and hunting. This decrease would be the result of lands directly impacted by the construction, operation, and decommissioning of Project components that would be removed from public

use (Table 3.17-4). As the setting is not unique, any recreation activities offered within the analysis area can be replicated on nearby BLM-administered lands. Users could be displaced and opportunities for public recreation activities could be diminished under Alternative B where public access would be restricted. Adjacent and surrounding areas may experience slightly increased recreational use from displaced users. Big game distribution would change due to species avoidance of developed Project components, leading to fewer individuals in the Project vicinity for the life of the Project. Increased vehicle collisions with big game species are also expected, which would lead to higher mortality rates in the area. These factors could lead to lower population sizes on lands surrounding the Project, which could diminish hunter experience.

Table 3.17-4. Acreage Unavailable for Public Recreational Use per Alternative

Impact Type	Alternative B (Proposed Action)	Alternative C	Alternative D
Access to BLM land lost	2,946 acres	2,986 acres	3,325 acres

Source: BLM (2023).

The removal of cover vegetation during pre-mining and mining operations would have an indirect impact on adjacent recreational users in the analysis area if it diminishes the quality of the recreational setting. Although the sight of mining activities may not affect some recreational users (e.g., OHV driving), those seeking the features of a natural setting may see the change to the existing landscape as an obstacle to their chosen recreation activity; for instance, noise from the transmission line or the sight of mining disturbances. Activities from mine operations that produce sound would be noticeable to users of adjacent dispersed recreation areas. The degree of impact from noise on the recreation setting is largely dependent on the chosen recreation activity, terrain shielding, open landscapes, and mining noise dispersion. Associated infrastructure construction may require motorized access in some areas where there is no access, introducing a new use and changing the recreation setting.

Under Alternative B, 0.5 miles of OHV routes within the Project area would no longer be accessible by the public due to perimeter fencing around mine facilities. This removal of existing OHV routes would decrease the availability of OHV opportunities in the area for recreators. Within the Project area, the southern access road would remain open to the public, although it would be fenced on either side through mining facilities to restrict access to Project infrastructure. Any roads outside the Project area would not be fenced to restrict access. Certain existing roads collocated with Project components, such as the transmission line and water pipeline, would actually be improved to graded roads from rugged roads that require technical four-wheel drive vehicles and skill. Limited closures due to road improvements may temporarily reduce OHV access, but access would be restored and improved when completed. The improved routes may increase OHV use and traffic due to increased accessibility that would accommodate all classes of vehicles. Access to surrounding unimproved roads would remain restricted to those with four-wheel drive only. The increased access equates to additional opportunities for dispersed recreation via these routes. This could increase the use of motorized routes and dispersed recreation, which would result in more socially developed recreation sites (e.g., OHV, recreational shooting, camping, etc.) along improved roads.

Under Alternative B, permanent impacts to hunting opportunities (for both big and small game) would occur on the 4,984 acres made unavailable for public recreational use by construction and operation of mining facilities (Table 3.17-5). Secondary impacts of the mine and associated infrastructure on big game animal distribution are harder to accurately predict but would occur. Although hunting would no longer be available on the land removed, opportunities within the affected hunt areas would not be eliminated completely since everywhere outside of the alternatives' footprints would remain available for hunting.

Hunting opportunities would also likely diminish based on reduced populations of big game and changes to species distribution within the affected areas. Increases in noise associated with the mine and mine-related infrastructure would disrupt hunting opportunities for the life of the mine by displacing big and small game animals and altering their distribution within the affected areas. These impacts would end once the Project is decommissioned. Under Alternative B, loss of currently accessible public land for hunting would be equal among big game species (Table 3.17-5). These areas would be permanently made unavailable to the public. Impacts on individual hunters may be temporary or permanent if public use of an individual hunter's preferred hunting grounds is eliminated, decreasing the chances of a successful hunt.

Mining activities likely would cause some wildlife species to temporarily avoid these areas due to increased noise, light, and human activity. Following mining activities, disturbed areas would return to preexisting conditions to the extent practicable. It is expected that wildlife would no longer avoid areas but return to the extent that the native habitats return. Active impacts on hunting would cease and hunting opportunities likely would improve over time as wildlife habitats return to disturbed areas.

Table 3.17-5. Acres of Big Game Habitat Permanently Impacted by Action Alternative

Big Game Habitat Layer	Alternative B (Proposed Action)	Alternative C	Alternative D
Antelope habitat	4,984 acres	4,984 acres	6,093 acres
Elk habitat	4,984 acres	4,984 acres	6,093 acres
Moose habitat	4,984 acres	4,984 acres	6,093 acres
Mule deer habitat	4,984 acres	4,984 acres	6,093 acres

Source: WGFD (2023).

3.17.2.4 *Alternative C*

The types of impacts under Alternative C would be largely similar to those described under Alternative B, though slightly more land would be impacted because the transmission line and access road location would shift.

Under Alternative C, 3.31 additional miles of NHTs or 5.3% more land in the analysis area could experience impacts from noise and visual disturbances associated with construction (Table 3.17-6). This change is due to an additional section of access road running parallel to I 80 heading west that would be developed within 5 miles of the NHTs. The access road would improve the existing Cedar Mountain Road. Although its development would not overlap any NHTs, the proximity of the access road would decrease the user experience due to construction activities that promote noise and visual intrusions from construction equipment, workers, and traffic. Noise generated from heavy equipment would be noticeable to NHT users, with the degree of impact to recreation setting depending on proximity to the construction activities. Impacts would persist past construction from increased traffic using the new access road through Project operations.

Under Alternative C, there would be an additional 40 acres (1.4%) of potential disturbance to public lands available to dispersed recreation within the Project area (Table 3.17-6). This increase is the result of the proposed access road and transmission line would shift when compared to Alternative B. The transmission line would be adjusted to run parallel to WY 374, then south across undisturbed BLM-administered and private lands to be collocated with the access road as it heads toward the Project area. Additionally, a section of the northern access road would be developed to connect to an existing exit along Cedar Mountain Road. Although these two changes would increase the total land disturbed, more of

the area impacted would be collocated with existing linear features on the landscape that have existing disturbance. As impacts would be concentrated to areas with existing disturbance, there would be less potential to conflict with dispersed recreation activities on previously undisturbed lands via transmission lines or access roads.

Under Alternative C, only 4.7 miles of the transmission line are running through undisturbed areas not collocated with another feature compared to 12.1 miles for Alternative B. Impacts from mine operations that develop linear features that would isolate or decrease access to areas with dispersed recreation activities would be noticeable to users. The degree of impact on the recreation setting is largely dependent on the chosen recreation activity, routes removed, and hunting opportunities that would be separated due to the development of these features. As less previously undisturbed areas would be impacted, there would be less potential to conflict with dispersed recreational activities such as OHV use and hunting from linear features that would segment the landscape.

Table 3.17-6. Impacts to Recreational Opportunities under Alternative C

Recreational Opportunity	Impact to Project Area	Impact to Analysis Area
Flaming Gorge NRA	13.70 acres	21,359.00 acres
Overland Historic Trail	0.00 mile	23.12 miles
NHTs	0.24 mile	65.54 miles
Flaming Gorge-Green River Scenic Byway	0.74 mile	24.32 miles

Source: BLM (2023), USFS (2023).

3.17.2.5 *Alternative D (Preferred Alternative)*

Impacts under Alternative D would be largely similar in type to those of Alternatives B and C, though the severity and resources impacted may differ. This variation is due to significant changes to the location of Project components such as the water pipeline, access roads, and processing facilities from Alternatives B and C.

Under Alternative D, Flaming Gorge NRA would not be intersected by any Project components, though potential for indirect impacts within the analysis area remain (Table 3.17-7). Under Alternative D, 9,811 fewer acres (43%) would be exposed to indirect impacts within 5 miles of Project components; therefore, impacts to Flaming Gorge NRA would be less under Alternative D than the other two action alternatives.

Table 3.17-7. Impacts to Recreational Opportunities under Alternative D

Recreational Opportunity	Impact to Project Area	Impact to Analysis Area
Flaming Gorge NRA	13.70 acres	11,548.00 acres
Overland Historic Trail	0.00 mile	17.52 miles
Flaming Gorge-Green River Scenic Byway	0.01 mile	10.91 miles

Source: BLM (2023), USFS (2023).

The Wilkins Peak Mountain Bike Trail System would not be impacted as no Project components intersect or are within 5 miles of the trail system. This makes Alternative D the only action alternative to not impact the trail system.

No NHTs would be impacted by Alternative D, as no Project components intersect or are within 5 miles of the trails. This makes Alternative D the only action alternative that would not impact NHTs.

Project components would overlap 0.73 mile (98.6%) less of the Flaming Gorge-Green River Scenic Byway due to the water pipeline moving to the north under Alternative D. This would also reduce indirect impacts to the byway by 13.41 miles (55.1%), as the pipeline would no longer run along WY 530 to the City of Green River. Remaining impacts would be a result of the section of the southern access road that connects to the byway. Disruptions to traffic and visual disturbances from construction of the water pipeline along the Flaming Gorge-Green River Scenic Byway would not occur under this alternative; therefore, Alternative D would have the least impact to the scenic byway.

Under Alternative D, there would be approximately 379 more acres (12.9%) of disturbance to public lands available to dispersed recreation within the analysis area (Table 3.17-7). The Project area and the processing facility to the north would be fenced for security, increasing the land that would be unavailable to the public for dispersed recreation such as hunting and OHV use. This increase would remove more public land than the other two action alternatives and would have a greater potential impact to dispersed recreation. Although more areas would be fenced to increase security, Project components such as the transmission line, access road, and brine pipeline would all be collocated from the processing facility to the mine permit boundary. This would decrease the potential for conflicts with dispersed recreation south of I 80 because fewer sections of undisturbed land in the area would be developed. The degree of impact from decreased access to these roads is largely dependent on the recreation user and their reliance on the area for their activity. Alternative D would impact the most land and has the largest potential to disrupt dispersed recreation activities.

More established OHV roads would be removed from public use due to Alternative D as fencing would be installed to reduce access to the processing facilities and the Project area. The removal of public OHV routes due to development of the processing facility would further decrease access to OHV users within the analysis area compared to the other action alternatives.

Decreased access may prevent hunting opportunities within the fenced areas, though impacts would be more concentrated as the Project components are less spread out than under the other action alternatives. Under Alternative D, there would be a loss of hunting opportunities on 6,093 acres of currently accessible public land (Table 3.17-7). The removal of access due to fencing may decrease hunting opportunities.

3.17.2.6 *Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity*

All action alternatives would result in irretrievable impacts to recreation through decreases in public land available for dispersed recreation and indirect impacts affecting the recreational experience on adjacent lands. Noise and disturbance impacts would be irretrievable until cessation of mine operations. Visual impacts to recreationists would be irreversible because reclaimed mining areas would still be visible and would contrast with the surrounding landscape. These visual impacts would lessen when these areas are reclaimed depending on revegetation success. Under all action alternatives, the Project is anticipated to conform with the Visual Resource Management (VRM) Class objectives as defined in the Kemmerer and Rock Springs RMPs. Some forms of recreation already interact with mining operations that exist on the landscape and may not be impacted from the proposed Project due to tolerance to visual impediments and the level of direct mine-related impacts to the activity; however, other forms of recreation may be indefinitely impacted directly and indirectly, which could alter the long-term sustainable recreational experience in the vicinity of the analysis area.

3.17.2.7 Cumulative Impacts

Potential cumulative impacts to recreation include any Project developments that would prevent or adversely affect existing recreational opportunities, either through direct loss of public recreation areas or loss of access to lands currently open to recreation, or through visual or noise impacts. Cumulative impacts could also include RFFAs that would beneficially affect existing recreation opportunities (Appendix E).

The total cumulative disturbance that could impact recreational experience, as identified in Appendix E, includes areas that may be directly disturbed either in the short term, such as through the installation of fiber optic cables and public highway pavement rehabilitations and structure repairs, or in the long term, such as the development and operation of the American Soda Solution Mining Expansion and Project West along with their associated pipelines, rail features, and access and maintenance roads. An agency-administered paleontological excavation planned for 2023 (2023 Tate Museum Paleontological Excavation Near Needles Reservoir) would also create short-term loss of recreational access and may increase OHV access due to the development of a temporary access route. The planned expansion of public trails, such as the Wilkins Peak and Skyline ADA trailheads, would create new opportunities for recreation and contribute to trail development in the Project vicinity.

The potential cumulative disturbance acreage for quantifiable RFFAs (i.e., RFFAs for which a discrete surface disturbance area is currently known) is 43,603 acres, which represents approximately 25% of the total public-administered lands available for recreation within the analysis area.

3.18 Socioeconomics

The socioeconomics assessment evaluates the interaction between a proposed action and the social/economic characteristics of communities that could be affected. The socioeconomics analysis area for this assessment is Sweetwater County, Wyoming. This analysis area was selected because socioeconomic impacts are most likely to occur within communities near the Project location. In addition to the county, the analysis considers potential socioeconomic impacts within the six incorporated cities or towns within Sweetwater County (Table 3.18-1; Appendix Q, Figure 3.18-1).⁵ No Tribally owned lands were identified within the analysis area.⁶ As discussed in Section 3.7 (Cultural Resources), cultural resources, historic trails, and resources and places of Tribal significance have been identified within the Project area.

Table 3.18-1. Cities or Towns Included in the Socioeconomic Assessment Area

City or Town (census category)	Census County Division	Approximate Straight-Line Distance from Mine Site to City or Town (miles)
Green River (city)	Green River North and South	20
Granger (town)	Green River North	21
Rock Springs (city)	Rock Springs North and South	34
Superior (town)	Rock Spring North	51
Wamsutter (town)	Wamsutter	96

⁵ Cities and towns are identified in U.S. Census Bureau (2023) as “incorporated places” or “census designated places.”

⁶ Specifically, no “Tribal block groups” were identified using U.S. Census Bureau (2023), and no Tribal lands or indigenous areas were identified using the EPA screening and mapping tool (EPA 2023). It is noted that the Project area is in the traditional homelands of the Eastern Shoshone, Shoshone Bannock, Northern Arapaho, and Ute Tribes.

City or Town (census category)	Census County Division	Approximate Straight-Line Distance from Mine Site to City or Town (miles)
Bairoil (town)	Wamsutter	130

Source: U.S. Census Bureau (2023).

This analysis considers three types of potential socioeconomic impacts:

1. Impacts on general socioeconomic conditions in the analysis area.
2. Impacts on specific economic industries potentially affected by the Project.
3. Impacts on low-income, minority, and Tribal populations.

A suite of socioeconomic indicators is used to characterize current socioeconomic conditions and evaluate potential impacts. Each type of impact uses different indicators. Impacts on general socioeconomic conditions are evaluated using indicators such as changes in population, employment and income, demand for lodging, and demand for public services. Impacts on specific economic industries are evaluated using indicators such as the number of firms, employment, and economic output of those industries.

General socioeconomic conditions and specific economic industries are characterized using county-level indicator data. Data at the state level serve as a reference for comparison purposes. Population and housing indicators are also presented for the cities and towns in Table 3.18-2. Specific demographics such as low-income, minority, and Tribal populations are considered at the census block group level, the smallest geographical unit for which the relevant demographic data are available.

Table 3.18-2. Population and Population Density

Geographic Area	2010 Population*	2021 Population†	2010 Population Density (residents per square mile)	2021 Population Density (residents per square mile)	Percentage Change in Population (2010 to 2021)
Wyoming	545,579	576,641	5.6	5.9	5.7%
Sweetwater County	42,266	42,459	4.0	4.1	0.5%
Green River North Census County Division (CCD)	10,355	10,093	5.9	5.7	-2.5%
Green River South CCD	3,787	3,696	3.6	3.5	-2.4%
Rock Springs North CCD	27,344	28,178	13.2	13.5	3.0%
Rock Springs South CCD	197	80	0.09	0.03	-59.4%
Wamsutter CCD	583	412	0.2	0.1	-29.3%
Bairoil	126	169	504.0	676.0	34.1%
Granger	137	127	55.5	51.4	-7.3%
Green River	12,260	11,887	874.5	847.9	-3.0%
Rock Springs	22,017	23,505	1.9	2.0	6.8%
Wamsutter	326	137	252.7	106.2	-60.0%

* Source: U.S. Census Bureau (2010a).

† Source: U.S. Census Bureau (2021a).

3.18.1 Affected Environment

This section characterizes the current conditions in the analysis area using recent and readily available data from government agencies and other sources.

3.18.1.1 General Socioeconomic Indicators

This section characterizes the general socioeconomic conditions of the assessment area. General socioeconomic indicators include population, employment and income, housing and lodging, public service provision, landownership, and government taxes and revenues.

Population

Table 3.18-2 reports the total population (number of residents) and population density (number of residents per square mile) within the assessment area. More than 80% of the population in Sweetwater County is within the cities of Green River and Rock Springs, which are within 35 miles of the Project area. The 2021 populations of the cities and towns vary considerably, from 127 residents in Granger to almost 24,000 in Rock Springs. The 2021 population density of the county is comparable to the population density of Wyoming as a whole. The population densities of the cities and towns are well above the state- and county-wide values, which is expected due to their smaller geographic areas.

Employment and Income

Table 3.18-3 presents statistics on employment (the number of employed persons) and per capita income. The unemployment rate in Sweetwater County (5.7%) is slightly higher than Wyoming (approximately 4.6%). Per capita income is lower in Sweetwater County compared to Wyoming.

Between 2000 and 2021, Sweetwater County and Wyoming employment and income are compared based on trends in employment and per capita income. Sweetwater County experienced a 5.9% change in employment, and Wyoming experienced a 26% increase in employment over this period. Sweetwater County experienced a 23.4% change in per capita income, from \$49,840 to \$61,489. Wyoming experienced a 49.6% change, from \$50,302 to \$75,239. The change in per capita incomes at the county level (23.4%) was lower than Wyoming (49.6%). The change in employment in Sweetwater County (5.9%) also lagged behind the statewide value (26.0%). Employment at the county level increased at a lower rate than the state, which is typical for a rural area (population density of 4.1 people per square mile) experiencing relatively low population growth (0.5%).

Table 3.18-3. Employment and Income

Statistic	Wyoming	Sweetwater County, Wyoming
Unemployment rate*	4.6%	5.7%
Employment (2000) [†]	324,653	24,023
Employment (2021) [†]	409,176	25,444
Employment percent change [†]	26.0%	5.9%
Per capita income (2000) [‡]	\$50,302	\$49,840
Per capita income (2021) [‡]	\$75,239	\$61,489
Per capita income percentage change	49.6%	23.4%

* Source: Headwaters Economics (2023a).

[†] Employment reported as the number of full-time plus part-time jobs. Source: Headwaters Economics (2023a).

[‡] Per capita income reported in 2022 dollars. Source: Headwaters Economics (2023a).

Table 3.18-4 shows the number of persons employed across different industries. In 2021, Sweetwater County's top four non-government employment industries were mining (including fossil fuels), construction, retail trade, and accommodation and food services. Wyoming's top four non-government

employment industries were construction, retail trade, health care and social assistance, and accommodation and food services.

Table 3.18-4. Employment by Industry in 2021

Industry	Wyoming	Sweetwater County, Wyoming
Non-services related	78,697	6,752
Farm	14,277	283
Forestry, fishing, and agricultural services	3,323	45
Mining (including fossil fuels)	18,824	3,448
Construction	29,989	1,662
Manufacturing	12,284	1,314
Services related	256,568	14,170
Utilities	2,551	425
Wholesale trade	8,547	656
Retail trade	39,259	2,734
Transportation and warehousing	16,124	1,294
Information	4,197	130
Finance and insurance	26,587	809
Real estate and rental and leasing	27,667	1,126
Professional and technical services	19,159	716
Management of companies	2,192	125
Administrative and waste services	14,540	813
Educational services	4,106	118
Health care and social assistance	30,657	1,532
Arts, entertainment, and recreation	8,233	292
Accommodation and food services	35,231	2,336
Other services, except public administration	17,518	1,064
Government	73,911	4,505
Residual*	0	17

Source: Headwaters Economics (2023a).

* Residual includes jobs that are not included in the categories above.

Figure 3.18-2 (Appendix Q) shows the relative number of persons employed in selected industries. The greatest differences are that Sweetwater County has a higher share of workers in the non-services industries, particularly mining and manufacturing, than Wyoming. Wyoming has a higher proportion of workers in service-based industries. These statistics are consistent with the rural nature of the county.

Housing and Lodging

This section summarizes the availability of housing and rental units in the analysis area. Information on hotels, motels, campgrounds, and RV parks is included because construction-related employees often prefer these areas for accommodations.

Table 3.18-5 summarizes housing and lodging stock in the socioeconomic analysis area. Hotels, motels, RV parks, and campgrounds are concentrated in the cities and towns.

Table 3.18-5. Housing and Lodging Characteristics

Geographical Area	Total Housing Units, 2021*	Vacant Units*	Vacancy Rate (%)†	Vacant Units for Rent‡	Rental Vacancy Rate (%)*	Vacant Units for Migrant Workers‡	Vacant Units for Seasonal, Recreational, or Occasional Use‡	Number of Hotels or Motels§	Number of RV Parks or Campgrounds¶
Wyoming	271,818	41,165	15.1%	7,977	10.8%	372	14,019	N/A	N/A
Sweetwater County	19,174	3,645	19.0%	1,417	25.6%	38	238	31	13
Bairoil	99	27	27.3%	0	0.0%	1	5	0	0
Granger	87	31	35.6%	0	0.0%	6	10	0	0
Green River	4,972	683	13.7%	481	31.3%	0	0	8	1
Rock Springs	10,688	2,124	19.9%	821	24.9%	0	0	20	3
Superior	136	87	64.0%	0	0.0%	0	10	0	0
Wamsutter	199	118	59.3%	15	20.5%	17	28	2	0

Note: N/A = not applicable.

* Source: U.S. Census Bureau (2021a).

† Calculated values; calculations performed prior to rounding.

‡ Source: U.S. Census Bureau (2021c).

§ Source: Google Maps (2023).

¶ Source: AllStays (2023); Google Maps (2023).

Public Service Providers

One important function of local government is the provision of public services related to health and well-being. These data, in conjunction with workforce estimates, can be helpful in evaluating the ability of local medical and public service providers to accommodate any Project-related increase in the demand for medical and public services.

Table 3.18-6 presents the number of emergency service providers and public schools in the assessment area. Public service providers are concentrated near the cities and towns. The socioeconomic study area has fire and public safety departments commensurate with the population and industrial activity in the county. The fire station nearest to the Project is the Green River Fire Department (18.1 miles from the mine permit boundary). The law enforcement department nearest to the Project is the Green River Police Department (18.9 miles to the mine permit boundary). The nearest hospital is the Castle Rock Medical Center (17.4 miles to the mine permit boundary). The nearest K-12 school system is in Green River.

Table 3.18-6. Number of Key Public Service Providers

Public Service Provider Type	Sweetwater County
Fire stations	15
Police departments	8
Hospitals	2
Public schools	19

Source: U.S. Department of Homeland Security (2023).

Landownership

As reported in Table 3.18-7, the majority of Sweetwater County is composed of public lands administered by federal agencies (70% of the total area). Federal lands are divided into lands administered by the BLM (93% of federal acreage), USFS (2%), and other federal agencies (5%). There is no land in the analysis area owned by Tribal populations. Additionally, 3% of the total area is administered by smaller government entities such as state, city, county, or other. The remaining 27% of acreage in Sweetwater County is privately owned.

Table 3.18-7. Landownership and Management

	Sweetwater County (acres)	Wyoming (acres)
Total area	6,714,345	62,598,290
Private lands	1,797,560	26,891,689
Federal lands	4,699,954	29,816,001
BLM	4,388,958	17,493,091
USFS	96,125	9,214,157
Other federal	214,871	3,108,753
Tribal lands	0	2,011,743
State, city, county, other	216,831	3,878,856

Source: Headwaters Economics (2023a).

Taxes and Revenues

Taxes provide funding for government entities to provide public services and maintain general operations. Tax and revenue data provide context for the taxes and fees that would be paid by the Project. Table 3.18-8 presents a summary of taxes and revenues for Sweetwater County. The total revenue for Sweetwater County in fiscal year 2021–2022 was approximately \$183 million.

Table 3.18-8. County Taxes and Revenues in Fiscal Year 2022

Revenue	Sweetwater County (\$)
Total revenue	\$183,079,261.87
Tax revenue*	\$36,867,299.48
Property tax	\$16,195,193.29
Specific ownership tax	\$1,359,432.07
Sales and use tax	\$6,001,028.82
Non-tax revenue*	\$146,211,962.39

Source: Sweetwater County (2023).

* Other types of taxes, such as the special fuel tax and property taxes paid by public facilities, are not reported in this table. Therefore, tax revenue is not equal to the sum of property tax, specific ownership tax, and sale and use tax as reported.

† Non-tax revenue includes all revenue that is not collected through taxation (e.g., administrative fees and transfers from other government entities).

Table 3.18-9 presents federal land transfers, which are small relative to the total taxes and revenues for the two counties. Payments in lieu of taxes (PILT) compensate governments for non-taxable federal lands within their borders and are calculated based on a county's population, revenue sharing payments it receives under other laws, and the amount of federal land within the affected county. In Sweetwater County, 91.4% of the total payments come from PILT. USFS payments are used for county roads and schools and revenue generated from USFS receipts (Headwaters Economics 2023a). BLM payments based on a portion of receipts generated on BLM-administered lands, such as grazing fees, contribute to counties' rural school and community services (Headwaters Economics 2023a).

Table 3.18-9. Federal Land Payments to State and Local Governments in 2019

Category	Sweetwater County	Wyoming
PILT	\$3,906,117	\$34,167,731
USFS payments	\$53,200	\$5,369,643
BLM payments	\$289,854	\$8,204,350
USFWS refuge payments	\$22,461	\$486,487
Federal mineral revenue payments	\$0	\$725,094,569
Total	\$4,271,631	\$773,322,778

Source: Headwaters Economics (2023a).

3.18.1.2 Specific Economic Industries and Public Values

This section characterizes existing conditions for several important economic industries and public values within the socioeconomic analysis area. These industries were chosen because they are important within the study area and because they could be affected by the Project.

Agriculture and Grazing

Table 3.18-10 presents statistics on the agricultural and grazing industries in the assessment area. Agriculture and grazing is one of the smaller non-service industries in Sweetwater County, comprising 1.1% of total employment; this is lower than Wyoming as a whole. A high proportion (more than 95%) of agricultural land is pasture and rangeland, which is higher than the statewide percentage.

Table 3.18-10 Agriculture and Grazing Statistics, Expressed in 2022 Dollars

Statistic	Sweetwater County	Wyoming
Number of farms (2017)	219	11,938
Employment (2021)	283	14,277
Percentage of total employment (2021)	1.1%	3.5%
Earnings (2021)	\$17,696,000	\$310,565,000
Acres of permanent pasture and rangeland (2017)	1,328,165	25,703,123
Percentage of agricultural land that is permanent pasture and rangeland (2017)	96.9%	88.6%

Source: Headwaters Economics (2023b); U.S. Department of Agriculture, National Agricultural Statistics Service (2017).

The analysis area for livestock grazing includes 520,688 acres (Section 3.14), which is 39% of the permanent pasture and rangeland area in Sweetwater County. The analysis area includes 19,400 permitted AUMs.

Mining

Sweetwater County has a long history of mining and extraction. Coal mining was active from the mid-nineteenth century through World War I when the Wyoming State Historical Society reports that area mines “sold as much coal as they could produce” (Gardner 2014). The county continued to produce coal and natural gas through World War II. After the war, trona mining largely replaced coal extraction, and today, natural gas and trona continue to lead extraction activity (Gardner 2014).

Sweetwater County’s economic history includes boom-bust cycles that are typical of mining and other natural resource-based industries. Boom-bust cycles are characterized by times of economic growth when commodity prices and demand for materials are high and by times of economic contraction when commodity prices fall. The area experienced a notable boom from 1970 through the early 1980s. This boom was followed by a period of sustained contraction in the area’s mining industry. Since 2000, mining-related earnings within the county, including fossil fuel extraction, have fluctuated between \$600 million and \$850 million annually; this level is consistently more than two times greater than earnings in the government sector, which is Sweetwater County’s second-leading source of earnings and the largest employer of individuals in the county (Headwaters Economics 2021).

According to the 2023 Wyoming Department of Revenue (WDOR) annual report (WDOR 2023a), state revenues from taxes on Sweetwater County property and minerals make the county the third-leading source of county tax revenue paid to the state of Wyoming.

Within Sweetwater County, four products constitute most of the taxable valuations from mining operations: natural gas at \$727.6 million; trona at \$566.3 million; oil at \$332.9 million; and surface coal at \$153.7 million.

The Wyoming State revenue forecast for fiscal years 2024 to 2028 (Consensus Revenue Estimating Group 2023) discusses expectations for Wyoming's trona industry through 2028. Annual production is expected to increase 9.1% in the short term, from 19.7 million tons in 2023 to 21.5 million tons in 2028. The price per ton is expected to decrease by 21.7%, from \$115.00 in 2023 to \$90.00 in 2028.

Table 3.18-11 presents statistics on the mining industry in the analysis area. Mining is one of the most important non-service industries in the analysis area, comprising 16.5% of employment in Sweetwater County, which is higher than Wyoming's 5.6%. There is no existing coal mining in the immediate Project area, as the coal is at depths that are not economically viable (Section 3.6). There is also no oil and gas extraction in the immediate Project area.

Table 3.18-11. Mineral and Oil Extraction Statistics, Expressed in 2022 Dollars

Statistic	Sweetwater County	Wyoming
Employment (2021)	3,262	14,758
Percent of total employment (2021)	16.5%	5.6%
Average annual wages per person (2021)	\$119,031	\$101,333

Source: Headwaters Economics (2023c).

Tourism and Outdoor Recreation

Residents of and visitors to Sweetwater County seek outdoor recreation and tourism activities, including attending museums and outdoor activities (e.g., river rafting, fishing, boating, hiking, biking, kayaking, and wildlife watching) (Travel Wyoming 2023). Sweetwater County is a hub for an assortment of tourism, drawing on Rock Springs' mining history and the entire region's unique desert environment, allowing for economic development in this industry. Flaming Gorge NRA is south of Green River, which provides hiking, mountain biking, and water sports on the reservoir, and borders Utah. This attraction draws in tourists that may use accommodations and engage in recreation in Green River and other cities in Sweetwater County.

Table 3.18-12 presents statistics on industries related to travel and tourism, including outdoor recreation, in the assessment area. Industries supporting travel and tourism make up approximately 14.7% of total employment in Sweetwater County, which is comparable to Wyoming. Within the county, food services and drinking places and gas stations are the two largest employers within the travel and tourism industry.

Table 3.18-12. Travel and Tourism Supporting Industry Statistics, Expressed in 2022 Dollars

Statistic	Sweetwater County	Wyoming
Percentage of total employment in travel- and tourism-related industries (2021)	14.7%	16.9%
Total employment in travel- and tourism-related industries (2021)	2,918	45,001
Gas stations	371	4,000
Passenger transportation	28	398
Arts, entertainment, and recreation	138	4,737
Accommodations	551	11,876
Food services and drinking places	1,628	21,209
Retail stores	202	2,781
Wages (annual per person in 2021)	\$21,258	\$27,289

Source: Headwaters Economics (2023d).

Property Values

Table 3.18-13 presents information on property values in the assessment area. The median home value in Sweetwater County is lower than the same measure at the state level. Although home values increased in all areas between 2006 and 2010 and 2007 and 2021, the rate of increase in the assessment area was generally not as rapid as was observed in Wyoming as a whole.

Table 3.18-13. Property Values

Geographic Area	Median Value 2017–2021 (\$)	Median Value 2006–2010 (\$)	Percentage Change from 2006–2010 to 2017–2021*
Wyoming	\$237,900	\$174,000	36.7%
Sweetwater County	\$217,300	\$169,500	28.2%
Bairoil	N/A	\$50,700	N/A
Granger	\$119,600	\$75,000	59.5%
Green River	\$229,600	\$195,400	17.5%
Rock Springs	\$218,400	\$170,600	28.0%
Superior	N/A	\$65,400	N/A
Wamsutter	N/A	\$130,700	N/A

Source: U.S. Census Bureau (2010b, 2021d).

Note: N/A indicates values where there was an insufficient number of sample observations to calculate a value.

* Calculated value. Calculations performed prior to rounding.

Public Values

In addition to economic values that are captured in markets, such as the value of agricultural and mining products and home values, the public also holds values for goods and services that are not traded in markets. Known as non-market values, these include the value to individuals of participating in outdoor recreation and other values associated with the character of the land, its ecosystems, and the opportunity for enjoyment by future generations. Outdoor activities, such as fee-free recreation on BLM-administered lands, hunting, fishing, and volunteering, are valued by the public. Residents may value the open space and rural views, as well as the lifestyles associated with farm and ranch operations, livestock grazing, and abundant recreational opportunities and may prefer land uses that conserve or enhance these values (BLM 2016c).

3.18.1.3 Low-income, Minority, and Tribal Populations

The following criteria were used to identify block groups for inclusion in the evaluation of potential impacts on low-income, minority, and Tribal populations:

- Low-income populations are present in a block group if the proportion of persons whose income is equal to or less than 200% of the federal poverty level is either 1) greater than 50%; or 2) is equal to or greater than the corresponding reference population, which is at the county level for this analysis.
- Minority populations are present in a block group if the proportion of persons who do not identify as “white alone, non-Hispanic” is either 1) greater than 50%; or 2) is equal to or greater than 110% of the corresponding reference population, which is at the county level for this analysis.

- Tribal populations are present in a block group if the proportion of persons who identify as “Native American or Alaska Native” is either 1) greater than 50%; or 2) is greater than the corresponding reference population, which is at the county level for this analysis.

All block groups in Sweetwater County are included in this analysis. The communities affected are not necessarily those within the project footprint but those who use that area. This is particularly relevant for indigenous populations. The people who currently use the area may come from the surrounding communities to work, recreate, and may be part of the workforce that would construct and maintain the mine facilities. Therefore, the socioeconomic analysis area is defined as all the block groups within Sweetwater County because the footprint of the project is completely within Sweetwater County and the people who use the area where the project is proposed are expected to be primarily from Sweetwater County. The reference area is Sweetwater County instead of the State of Wyoming because Sweetwater County is more representative of socioeconomic conditions in the area than the entire state. Table 3.18-14 identifies each block group, reports the minimum distance between the block group and the nearest Project component, and applies the criteria above to identify potential low-income, minority, and Tribal populations. The table also presents the proportion of persons in each block group who have limited English proficiency. The latter can be used to inform public outreach efforts and engagement opportunities.

- Of the 34 census block groups in Sweetwater County, 24 (71%) meet one or more of the criteria for low-income, minority, and Tribal populations.
- Of the 24 block groups, 22 (92%) that have low-income, minority, or Tribal populations are in or around the nearby cities of Green River and Rock Springs (Appendix Q, Figure 3.18-3).
- Of the 24 that meet one or more criteria for a low-income, minority, or Tribal population, 14 (58%) meet only one of the criteria, eight (33%) meet two criteria, and two (8%) meet all three criteria.

The locations of block groups that meet criteria for low-income, minority, or Tribal populations are shown on Figure 3.18-3 (Appendix Q).

Table 3.18-14. Identification of Low-Income, Minority, and Tribal Populations within Sweetwater County

Block Group ID Number for Figure	Geographic Area	Minimum Distance to Project (miles)	Proportion Minority (%)	Proportion Low-Income (%)	Proportion Tribal (%)	Low-Income, Minority, or Tribal Population*	Proportion Limited English Proficiency (%)
	Sweetwater County, Wyoming	N/A	21.7	22.4	2.1	N/A	3.6
1	Block Group 1, Census Tract 9705	0.00	29.2 [†]	36.7 [†]	0.0	Yes [†]	5.0
2	Block Group 2, Census Tract 9705	3.04	20.4	27.1 [†]	2.1 [†]	Yes [†]	8.2 [‡]
3	Block Group 1, Census Tract 9706.01	0.00	37.5 [†]	38.6 [†]	0.7	Yes [†]	18.9 [‡]
4	Block Group 2, Census Tract 9706.01	1.58	33.3 [†]	11.9	0.0	Yes [†]	8.3 [‡]
5	Block Group 3, Census Tract 9706.01	0.95	18.9	14.3	0.0	No	0.0
6	Block Group 4, Census Tract 9706.01	2.03	18.5	16.5	0.0	No	0.0
7	Block Group 1, Census Tract 9706.02	1.07	25.8 [†]	23.0 [†]	15.8 [†]	Yes [†]	0.0
8	Block Group 2, Census Tract 9706.02	0.42	11.7	1.4	2.3 [†]	Yes [†]	0.0
9	Block Group 3, Census Tract 9706.02	0.60	18.0	14.2	3.6 [†]	Yes [†]	2.0
10	Block Group 1, Census Tract 9707	0.00	4.9	13.4	0.4	No	0.8
11	Block Group 2, Census Tract 9707	0.53	20.7	14.6	2.7 [†]	Yes [†]	0.0
12	Block Group 3, Census Tract 9707	1.74	20.6	19.6	3.3 [†]	Yes [†]	0.4
13	Block Group 1, Census Tract 9708	19.02	23.6	43.8 [†]	0.0	Yes [†]	0.0
14	Block Group 2, Census Tract 9708	18.33	29.4 [†]	21.6	4.7 [†]	Yes [†]	0.0
15	Block Group 3, Census Tract 9708	17.67	11.6	36.3 [†]	0.0	Yes [†]	0.0
16	Block Group 4, Census Tract 9708	17.61	13.7	17.5	0.0	No	0.0
17	Block Group 1, Census Tract 9709.02	16.06	16.2	11.4	0.0	No	1.0
18	Block Group 2, Census Tract 9709.02	15.66	33.5 [†]	33.5 [†]	3.4 [†]	Yes [†]	6.3 [‡]
19	Block Group 3, Census Tract 9709.02	14.99	16.7	14.7	0.7	No	5.0
20	Block Group 1, Census Tract 9709.03	17.06	38.5 [†]	13.8	0.0	Yes [†]	15.7 [‡]
21	Block Group 2, Census Tract 9709.03	10.94	44.0 [†]	50.9 [†]	1.8	Yes [†]	15.5 [‡]
22	Block Group 1, Census Tract 9709.04	17.76	24.2 [†]	13.1	0.0	Yes [†]	3.5
23	Block Group 2, Census Tract 9709.04	16.17	12.2	28.7 [†]	0.4	Yes [†]	0.6
24	Block Group 1, Census Tract 9709.05	13.75	37.7 [†]	23.3 [†]	1.1	Yes [†]	0.8

Block Group ID Number for Figure	Geographic Area	Minimum Distance to Project (miles)	Proportion Minority (%)	Proportion Low-Income (%)	Proportion Tribal (%)	Low-Income, Minority, or Tribal Population*	Proportion Limited English Proficiency (%)
25	Block Group 2, Census Tract 9709.05	13.00	19.2	20.1	4.1 [†]	Yes [†]	0.0
26	Block Group 1, Census Tract 9710	16.42	21.7	22.7 [†]	7.3 [†]	Yes [†]	0.6
27	Block Group 2, Census Tract 9710	9.45	27.3 [†]	14.4	0.7	Yes [†]	9.3 [‡]
28	Block Group 1, Census Tract 9711	17.51	21.7	57.5 [†]	5.2 [†]	Yes [†]	5.2 [‡]
29	Block Group 2, Census Tract 9711	17.28	16.7	19.7	0.7	No	0.1
30	Block Group 3, Census Tract 9711	16.92	11.2	17.7	0.1	No	3.0
31	Block Group 1, Census Tract 9712	18.00	5.8	13.5	0.0	No	1.6
32	Block Group 2, Census Tract 9712	18.03	21.4	27.3 [†]	1.1	Yes [†]	6.6 [‡]
33	Block Group 1, Census Tract 9716	20.78	7.5	10.0	1.4	No	0.0
34	Block Group 2, Census Tract 9716	3.93	21.7	33.1 [†]	0.0	Yes [†]	4.6

Source: U.S. Census Bureau (2021e–h).

* “Yes” implies that block group meets criteria for any combination of low-income, minority, or Tribal populations.

[†] Blue shading indicates that block group data meet one or more criteria for a low-income, minority, or Tribal population.

[‡] Orange highlighting indicates block groups with a proportion of persons with limited English proficiency greater than 5%.

3.18.2 Environmental Consequences

3.18.2.1 Analysis Method

This analysis considers three types of potential socioeconomic impacts:

1. Impacts on general socioeconomic conditions in the analysis area.
2. Impacts on specific economic industries potentially affected by the Project.
3. Impacts on low-income, minority, and Tribal populations.

A suite of socioeconomic indicators is used to characterize current socioeconomic conditions and evaluate potential impacts. Each type of impact uses different indicators.

Impacts on the demand for housing and public services are evaluated by calculating the percentage change in population within the analysis area (Sweetwater County) resulting from the in-migration of non-local workers and then considering how that would affect demand. Non-local workers are defined as those workers who, absent the Project, would reside outside the analysis area. It is assumed that demand for housing and public services increases approximately proportionally to the change in population. It is further assumed that up to one housing or lodging unit is required for each non-local worker.

Impacts on employment, income, and economic output throughout the analysis area is estimated using the Economic Impact Analysis for Planning (IMPLAN) model. The IMPLAN analysis estimates the changes in these socioeconomic indicators resulting from the direct Project-related expenditures on labor and materials, as well as the indirect and induced impacts as money circulates throughout the local economy. The IMPLAN model is described further below. In addition to providing insight into the overall impact in Sweetwater County, IMPLAN results for specific industries are used to evaluate impacts on several important industries, including mining, agriculture and grazing, and tourism and recreation.

The analysis of potential impacts on low-income, minority, and Tribal populations considers whether Project-related impacts would result in negative impacts on low-income, minority, or Tribal populations within the analysis area. The analysis considers the types, severity, and duration of all potential impacts considered in this EIS.

As appropriate, the analysis considers two distinct time frames: 1) construction and development activities for approximately 4 years; and 2) operations for approximately 31 years, for a total Project life of 34 years. Production and post-mining closure activities would be conducted in a rolling manner, as development of different sections of the mine would be conducted on a staggered timeline.

3.18.2.2 Alternative A (No Action)

Under the No Action Alternative, no additional expansion onto BLM- or USFS-administered lands would occur. No ground disturbance would occur, and there would be no changes or alterations to the landscape; therefore, there would be no Project-related impacts to socioeconomic conditions or to low-income, minority, or Tribal populations. Existing conditions and trends in the analysis area would continue.

3.18.2.3 *Alternative B (Proposed Action)*

General Socioeconomic Conditions

Population

Construction

Construction of the Project is anticipated to require an average workforce of 3,091 employees over a period of 4 years, with a peak workforce of 5,247 employees. The Applicant expects that 15% of the construction workforce would be local (i.e., residents of Sweetwater County), and 85% would either commute to the Project area from nearby counties or would temporarily relocate to Sweetwater County. Therefore, the local population would increase by up to 4,460 persons, assuming that family members do not accompany workers. The population of Sweetwater County is more than 42,459 (Table 3.18-2). The peak in-migration of construction workers represents a population increase of approximately 10.5%. The average increase would be 58.9% of this number, an increase in population of 6.2%.

As discussed below, construction of the Project would support employment in industries that support Project construction. Some of this employment could result in temporary in-migration of workers, which would result in a higher increase in population during construction.

Operations

The Project is expected to employ 530 workers in the mining industry during operations, 90% of whom would be current Sweetwater County residents. This implies that there would be an in-migration of 53 workers during the 31-year operations period, a negligible increase in population. As discussed below, operation of the Project is estimated to increase employment in sectors that support mining. Some of this employment could be met by in-migration of non-local workers.

Employment, Income, and Economic Output

Selected economic impact metrics within Sweetwater County were estimated using the IMPLAN model. As stated on the IMPLAN (2023) website, “IMPLAN is a regional economic analysis software application that is designed to estimate the full economic impact, including ripple effects, of a given economic activity within a specific geographic area through the implementation of its Input-Output model.” The model uses data to characterize existing linkages between industries in a given area to estimate the magnitude and nature of additional economic activity as it ripples through the economy.⁷

⁷ Because the model relies on existing linkages as they existed in previous years, the following assumptions are implied: constant returns to scale; no supply constraints; fixed input structure; industry technology assumption; constant byproducts coefficients; and the underlying model linkages are not affected by Project input values. These assumptions lead to the following key limitations in input-output models (IMPLAN 2023):

- Feasibility: The assumption that there are no supply constraints and there is fixed input structure means that, even if input resources required are scarce, the model assumes the same portion of production value will always be required to acquire that input. The assumption of no supply constraints also applies to workers; essentially, the model assumes there are no constraint on the workforce from which a business or organization can draw.
- Backward-linked and static model: Input-output models do not account for forward linkages, nor do input-output models account for offsetting effects, such as cannibalization of other existing businesses, diverting funds used for the Project from other potential or existing projects, etc.
- Each model run assumes that, in the absence of this Project, the allocated funds would not be spent in the area. Therefore, this economic impact study reports gross impacts of the Project and does not attempt to estimate impacts of alternative spending options.

The Project's economic impacts derive from 1) direct expenditures made by the Applicant and its contractors on goods and services at local vendors and wages paid to local workers, 2) indirect impacts created when those local vendors restock their shelves, and 3) induced impacts created when Project workers and workers at local suppliers spend their wages locally.

Construction was modeled based on expected Project-related labor and non-labor expenditures provided by the Applicant. Operations were modeled on an annual basis, using the projected average production of trona.

Table 3.18-15. Summary of Economic Impact Analysis for Planning Model Inputs for Alternative B

Input Category	Total during Construction (\$)	Annual During Operations (\$)	Local Proportion During Construction (%)	Local Proportion During Operations (%)
Labor expenditures	\$1,962,549,694	N/A	15%	90%
Non-labor expenditures	\$3,415,661,884	N/A	5%	100%
Annual value of output (soda ash and bicarbonate)	N/A	\$873,376,000	N/A	N/A

Note: N/A = not applicable.

The model was run at the county level. As described in the following bullets, multiple metrics were used to characterize economic impacts, such as the following:

- The most widely used and broadest measure of economic activity is *industry output*. Industry output represents the value of total goods and services in the return on investment. The reported industry output is the value of total goods and services generated in the return on investment by Project activities.
- *Value added* is a measure of the wealth created by industries and is the value of total goods and services produced, minus the intermediate inputs used to produce the goods and services.
- *Earnings* (a subset of industry output) and *employment* (the number of full-time and part-time jobs combined) are also estimated; these impacts may be of more practical value to policy makers as they relate to economic benefits received by residents.

Construction

During construction, it is estimated that 15% of the workforce would be Sweetwater County residents and 5% of spending on equipment and materials would occur within Sweetwater County. This direct employment and spending would stimulate local economic activity. Additionally, as non-local workers commute into the Project area, they would spend money on goods and services, such as lodging, food, and fuel for their personal vehicles.

Table 3.18-16. Summary of Economic Impact Analysis for Planning Model Results During the 4-Year Construction Period

Impact Category	Industry Output (\$)	Value Added (\$)	Earnings (\$)	Employment
Direct	\$902,558,727	\$517,248,895	\$401,814,400	9,426
Indirect	\$155,941,884	\$74,407,133	\$46,936,468	945

Impact Category	Industry Output (\$)	Value Added (\$)	Earnings (\$)	Employment
Induced	\$173,091,864	\$99,315,649	\$44,016,270	1,131
Total	\$1,231,592,476	\$690,971,678	\$492,767,137	11,502

Table 3.18-17. Top 10 Affected Industries During the 4-Year Construction Period

Rank (by estimated industry output growth)	Industry	Total Change in Industry Output (\$)	Change in Earnings (\$)	Change in Employment
1	Construction	\$491,349,473	\$292,123,831	4,755.2
2	Accommodation and food services	\$437,318,030	\$111,478,166	5,062.0
3	Real estate and rental	\$73,719,536	\$2,160,624	181.4
4	Retail trade	\$45,818,986	\$14,309,676	449.9
5	Wholesale trade	\$32,636,042	\$7,665,301	99.0
6	Utilities	\$23,635,361	\$3,575,364	20.0
7	Transportation and warehousing	\$18,354,622	\$6,638,222	112.5
8	Health care and social assistance	\$16,749,008	\$8,237,022	196.0
9	Administrative and support and waste management and remediation services	\$16,442,867	\$5,656,148	147.7
10	Finance and insurance	\$15,534,747	\$3,192,779	71.2

Note: This table includes all impacts (direct, indirect, and induced).

Operations

Annual impacts during operations are summarized in Tables 3.18-18 and 3.18-19. Values are generally similar to those associated with construction, because, although there is less overall economic activity during operations, more of it occurs within Sweetwater County.

Table 3.18-18. Summary of Economic Impact Analysis for Planning Model Results During the 31-Year Operational Period (annual impacts)

Impact Category	Industry Output (\$)	Value Added (\$)	Earnings (\$)	Employment
Direct	\$911,855,713	\$377,127,883	\$142,706,046	796
Indirect	\$204,415,211	\$95,724,603	\$50,746,789	692
Induced	\$68,693,124	\$39,415,185	\$17,445,765	449
Total	\$1,184,964,049	\$512,267,670	\$210,898,599	1,937

Table 3.18-19. Top 10 Affected Industries During the 31-Year Operational Period (annual impacts)

Rank (by estimated industry output growth)	Industry	Total Change in Industry Output (\$)	Change in Earnings (\$)	Change in Employment
1	Mining	\$928,342,679	\$84,601,520	817.5
2	Utilities	\$53,063,937	\$8,090,473	44.9
3	Finance and insurance	\$30,654,039	\$6,444,984	118.5

Rank (by estimated industry output growth)	Industry	Total Change in Industry Output (\$)	Change in Earnings (\$)	Change in Employment
4	Real estate and rental	\$29,620,171	\$1,422,364	64.2
5	Wholesale trade	\$25,455,557	\$5,572,388	71.4
6	Transportation and warehousing	\$23,495,618	\$7,145,289	102.9
7	Construction	\$15,746,579	\$3,128,757	61.8
8	Retail trade	\$13,418,698	\$4,332,876	130.0
9	Management of companies	\$11,003,118	\$4,998,143	50.9
10	Professional–scientific and tech services	\$10,495,203	\$3,576,777	77.5

Note: This table includes all impacts (direct, indirect, and induced).

Housing and Lodging

Construction

As previously noted, there would be an in-migration of up to 4,460 non-local workers during construction. Although temporary workers frequently use recreational vehicles as living quarters and regularly share accommodations, if each worker were to require their own housing unit, a maximum of 4,460 temporary housing or lodging units would be required in or near the assessment area. No worker camps are currently proposed.

Sweetwater County has approximately 1,400 vacant housing units for rent, 31 hotels or motels, and 13 RV parks or campgrounds (Table 3.18-5). Statista (2023) reports that economy-scale hotels and motels have an average of 75 rooms per location; therefore, the hotels and motels in Sweetwater County have an estimated 2,325 rooms. The annual hotel and motel occupancy rate for Wyoming in 2023 is estimated to be 58.4%. This implies that there are, on average, 967 available hotel or motel rooms.

Depending on factors such as the proportion of workers commuting from outside Sweetwater County, the proportion of workers who share housing or lodging, and the extent to which housing units are used compared to hotels, motels, and campgrounds, the demand for temporary housing and lodging by the non-local construction workforce could result in a shortage of available short-term accommodations. Given that the average workforce is approximately three times the average number of rooms available, housing shortages are very likely if most non-local workers would stay in hotels and motels within the county.

Operations

Five non-local workers are expected on-site during Project operations. There is sufficient long-term housing to meet the demand of five workers and their families.

Public Service Providers

The presence of a non-local workforce could result in increased demand for services, such as emergency medical support. If users are paying fees for service, increased demand is generally viewed as beneficial unless the magnitude of the increase places strain on the providers. When services are provided without use fees, the increase in demand is generally viewed as adverse.

As previously reported, the change in county population—a proxy for the increase in demand for public services—would be up to 10.5% during construction and only a fraction of a percent during operations. Considering the number of hospitals, fire stations, and law enforcement agencies reported in Table 3.18-6,

the increased demand for public services during construction may place some strain on public service providers. Impacts during operations would not likely be detectable.

Taxes and Revenue

The following four categories of Sweetwater County taxes would apply to the Project:

- Sales and use tax would be payable on Project-related spending on materials and equipment within the county and spending by non-local Project workers within the county.
- Lodging tax would be payable on each night of lodging by non-local workers.
- During operations, an ad valorem property tax would be paid based on the estimated market value of trona production.
- During operations, a severance tax would be applied based on the estimated market value of trona production.

The Applicant estimates that Project construction expenditures would total \$5,378,211,578 over the 4-year construction period, of which \$3,415,661,884 would be equipment and materials costs and \$1,962,549,694 would be labor costs. An estimated 5% of equipment and materials costs (\$170,783,094) would be purchased within Sweetwater County and therefore subject to county sales and use tax. The tax rate is 2% (WDOR 2023b), which would yield taxes of \$3,415,662 (calculated as \$170.8 million local equipment and material expenditures $\times$ 0.02 tax rate).

The Applicant expects the average workforce during construction to be 3,091 persons and that 85% of the workforce (2,627 workers) would be non-local. The General Services Administration per diem rate for meals and incidentals is \$59. Assuming this is all spent within Sweetwater County, the annual taxable sales during construction is 2,627 workers $\times$ \$59 per worker-day $\times$ 365 days per year = \$56,572,445. The Sweetwater County sales and use tax is 2%; therefore, the annual taxes would be \$1,131,448.

The total annual sales and use tax during construction would be \$4,547,110.

Assuming that each worker requires their own room; $2,627 \times 365 = 958,855$ room-nights are required each year of construction. The General Services Administration per diem lodging rate is \$98 per night. Therefore, the total cost of room-nights is $958,855 \times \$98 = \$93,967,790$. The Sweetwater County lodging tax rate is 4% (Asher 2023). Therefore, annual lodging taxes would be \$3,758,712 (calculated as \$93,967,790 in lodging expenditures $\times$ 0.04 tax rate).

The property tax for mineral extraction is based on the assessed value of production. The Applicant estimates that the annual amount of trona produced would be 5.24 million MT. WDOR (2023b) reports that the ad valorem tax in Sweetwater County is \$1.88 per ton of trona. Applying this to the annual production, the tax is estimated to be \$9,852,858 per year.

The severance tax is also based on the assessed value of production. Based on data reported in WDOR (2023b), the severance tax for trona in Sweetwater County is 61.1% of the ad valorem tax. Applied to the ad valorem tax estimated above, the severance tax would be $\$9,852,858 \times 0.611 = \$6,020,096$ per year.

Table 3.18-20 summarizes the taxes payable to Sweetwater County. The total taxes payable to Sweetwater County over the 35-year life of the Project is approximately \$514.8 million (Table 3.18-20). This is an annual average of approximately \$14.7 million per year. The annual tax revenue for Sweetwater County was \$36.9 million in 2022, and the annual total revenue in 2022 was \$183.1 million. The average annual taxes from the Project represent a 39.8% increase in taxes and an 8.0% increase in total revenue, assuming other sources of revenue remain constant.

Table 3.18-20. Taxes Payable to Sweetwater County under Alternative B

Project Phase	Category	Average Annual Amount (\$)	Project Totals (\$)
Construction (4 years)	Sales and use tax	\$4,547,110	\$18,188,440
	Lodging tax	\$565,724	\$2,262,896
	Construction subtotal	\$5,112,834	\$20,451,336
Operations (31 years)	Ad valorem property tax	\$9,852,858	\$305,438,598
	Severance tax	\$6,020,096	\$186,622,976
	Operations subtotal	\$15,872,954	\$492,061,574
Total (35 years)		N/A	\$514,775,806

Note: N/A = not applicable

Specific Economic Industries

Agriculture and Grazing

Almost all of the agricultural land in Sweetwater County is for livestock grazing (Table 3.18-10); the Project would preclude grazing on some land that is currently available for grazing. Removal of land may reduce the AUMs supported in Sweetwater County. An estimated 183 permitted AUMs would be impacted under Alternative B, which is 0.94% of the permitted AUMs in the livestock grazing analysis area (Section 3.14).

Table 3.18-21 summarizes changes in economic indicators for the livestock industry associated with impacts to AUMs, under the assumption that the impacted AUMs are lost and cannot be made up on lands elsewhere in Sweetwater County.

Table 3.18-21. Economic Impacts to the Grazing Industry

Statistic	Cattle	Sheep	Total
Jobs per thousand AUMs	0.709	0.951	N/A
Earnings per AUM (2023 \$)	\$34.47	\$10.09	N/A
Total economic impact per AUM (2023 \$)	\$111.34	\$73.28	N/A
Livestock inventory (U.S. Department of Agriculture 2017)	21,554	5,754	27,308
Reduction in permitted AUMs*	144.4	38.6	183.0
Reduction in jobs	0.1024	0.0367	0.1391
Reduction in earnings (2023 \$)	\$4,977.50	\$389.50	\$5,367.00
Reduction in total economic impact (2023 \$)	\$16,077.50	\$2,828.60	\$18,906.10

* AUMs allocated across cattle and sheep based on their relative livestock inventories.

Source: Bureau of Labor Statistics (2023); BLM (2008).

Note: N/A = not applicable

Mining

There would be positive impacts on the trona mining industry, as the Project would support continued employment and economic output from trona mining (see economic impact estimates above). No impacts to coal mining or oil and gas extraction are expected, as these do not occur in the immediate Project area.

Tourism and Outdoor Recreation

Metrics for industries that support tourism and outdoor recreation are provided in Section 3.18.1.2. As discussed in Section 3.17.2.3, Alternative B would result in impacts to recreational activities. This section considers how those impacts would affect the tourism and recreation industries. In general, negative impacts to the tourism and recreation industries are expected when there is a decrease in the amount of spending by recreationists on goods and services such as temporary lodging, food, fuel, equipment, and outfitters and guides. The key question for this analysis is whether the Project's impacts on recreation are likely to result in reduced spending by recreators at the county level.

Impacts would occur on a relatively small proportion of lands available for recreation in the county. Most impacts to named recreation areas, trails, or scenic byways would involve disturbances such as changes in visual quality, noise, and vibrations, rather than changes in access. Two named recreation areas would be affected by the water supply line: the Flaming Gorge NRA and the Flaming Gorge-Green River Scenic Byway.

The water supply line would cross the northwestern portion of the NRA. Based on online maps and websites providing information on recreation, this portion of the NRA has few paved roads other than WY 530 and few, if any, developed recreational facilities. As such, this portion of the NRA likely receives fewer visitors than other portions of the NRA. Due to its proximity to the City of Green River and WY 530, it is likely that some Green River residents visit this portion of the NRA, particularly those persons who are seeking a more remote and less crowded experience.

The water supply line would be located near WY 530 (which is part of the Flaming Gorge-Green River Scenic Byway) for approximately 11 miles. The byway includes portions of WY 530 and US 191 for a total of 160 miles (WyomingTourism.org 2023). Thus, a relatively small portion (7%) of the byway would be affected by the Project.

The remaining impacts of the Project on recreation generally involve changes in the availability of lands for recreation within the footprint of the Project and/or reductions in the quality of recreational experiences near the Project. Whenever there are reductions in lands available for recreation or decreases in recreational quality, it is likely that fewer recreation-days would be taken in those areas. It is expected that at least some of those visits would be taken to other locations within Sweetwater County, implying that the overall change in recreation visitation (and associated spending) at the county level should be less than the change occurring at the areas affected by the Project. In other words, recreationists are expected to change their behaviors in ways that mitigate the negative impacts of the Project on their recreational activities given monetary, time, and other constraints.

In this case, non-local visitors to the county are not expected to significantly reduce visitation or spending, as the impacts near attractions most likely to draw non-local visitors such as the NRA and the scenic byway are expected to be mild. The most impactful changes – a reduction in land and disturbances in and around the Project – occur in more remote areas that are more likely to be visited by locals, who have ample opportunities to recreate at other similar locations in the county.

Therefore, the potential change in recreation-days and associated spending at the county level is expected to be negligible. As such, any changes to the tourism and outdoor recreation industries in the county, such as changes in employment and income, are also expected to be negligible.

Property Values

Most of the land impacted under Alternative B is publicly owned and managed by federal agencies. Compensation for potential changes in land values on private lands that would be directly impacted would

be negotiated between the landowners and the Applicant during the acquisition of land and/or easements. Material impacts to the market values of other lands are not expected.

Public Values

Alternative B would result in changes in some resources and changes in the local economy that could affect public values. Some members of the public may hold positive values for some changes, and some may hold negative values for some changes. For example, the public value of habitat and cultural resources would likely be reduced. Other public values, such as those that stem from higher employment and income in the county, would likely be increased. The overall magnitude and potential direction of change in public values is unknown.

Low-Income, Minority, and Tribal Populations

The analysis of potential impacts on low-income, minority, and Tribal populations considers whether members of these communities would be adversely affected by the Project.

The vast majority of the Project footprint is located within Block Group 1 of Census Tract 9707, which does not meet the criteria for a low-income, minority, or Tribal community (Table 3.18-14; Appendix Q, Figure 3.18-3). The other two block groups containing a portion of the Project footprint (Block Group 1 of Tract 9705 and Block Group 1 of Tract 9076.01) meet one or more criteria for low-income, minority, or Tribal communities. Each of these block groups contains a portion of one linear feature of the Project. Other block groups that meet one or more criteria for low-income, minority, or Tribal communities are potentially affected by the Project even though they do not contain any of the Project footprint. The rail line and access road terminate within 1 mile of residences in Granger that are within low-income, minority, or Tribal communities, and the water supply line terminates within 1 mile of residences in Green River that are within low-income, minority, or Tribal communities. Otherwise, few if any residences within low-income, minority, or Tribal communities would be located within 1 mile of these linear features.

When conducting this assessment, the full range of Project-related changes that could affect humans was considered (e.g., changes in air quality, changes in water quality, degradation of cultural resources, socioeconomic alterations, etc.). In each instance, the analysis considered whether minority and low-income populations comprise a higher proportion of the population within the areas of adverse impacts and/or would have different ways, relative to the general population, of being adversely affected by the Project. Four specific questions were posed, and both direct and indirect Project impacts were considered when answering these questions:

1. Do members of low-income, minority, or Tribal communities comprise a higher proportion of persons who would be exposed to adverse impacts?
2. Are members of low-income, minority, or Tribal communities likely to be adversely affected because they are sensitive to a given level of exposure due to pre-existing medical conditions and/or reduced access to health care and/or because they are exposed to higher baseline concentrations of health stressors such as PM_{2.5}?
3. Are members of low-income, minority, or Tribal communities likely to be adversely affected due to lifestyle approaches, such as subsistence fishing, and/or because they have specific cultural, community, or religious practices or values?
4. Are members of low-income, minority, or Tribal communities likely to be adversely affected because their economic status or language barriers prevent them from taking mitigating actions that general members of the public might readily adopt, such as closing doors and windows to limit dust exposure?

Where the answer to any question was “yes,” an adverse impact is indicated in Table 3.18-22. Each row in Table 3.18-22 pertains to a different resource discussed in the EIS. In each row, the potential impacts on low-income, minority, and Tribal communities relevant to a particular resource are summarized. The reader can refer to the referenced sections of the EIS for more information on the nature and extent of impacts for a particular resource.

Note that any adverse impacts to natural resources may decrease public value. Further, any change in the public value of natural resources is likely to be higher for Tribal members or persons of indigenous heritage than the general population because of spiritual, cultural, and/or other reasons. Therefore, any adverse impact to natural resources is potentially an adverse impact on low-income, minority, and Tribal communities. Impacts related to the potential reduction in the public value of natural resources is included within the socioeconomics row of the table. Similar reasoning applies to the potential use of natural resources by Tribal members and/or persons of indigenous heritage for subsistence, medicinal, cultural, spiritual, or other reasons. As with the reduction in public value, this is included in the socioeconomics row in Table 3.18-22.

Table 3.18-22. Resource-Specific Impacts for Alternative B

Resource (EIS Section)	Primary Conclusions	Adverse Impact to Low-Income, Minority, or Tribal Communities
Air quality (3.3)	Air quality during construction may be adversely affected by emissions from construction-related activity. Air quality monitoring indicates that potential exceedances of air quality standards and potential health effects would be limited to a relatively small area around the mine property, but not extending along the linear features such as the rail line and water supply pipeline. The area where exceedances might occur are within a block group that does not meet the criteria for a low-income, minority, or Tribal community, and there are few if any residences near the mine. Exposure would therefore be limited to workers and any recreators near the mine. Recreators' exposure would be limited by the amount of time spent there. However, adverse impacts could occur to members of low-income, minority, and Tribal populations who are either onsite workers or are recreators within the small area where there are air quality exceedances.	Yes
GHG emissions and climate change (3.3)	The Project would have direct GHG emissions. However, when considered at a global level, the Project could result in a reduction of global GHG emissions or could result in no net change to GHG emissions (i.e., global GHG emissions would not be increased as a result of the Project) based on the following information. Grand View Research (2022) reports "The U.S. trona market size was valued at USD 1.21 billion in 2022 and is expected to grow at a compound annual growth rate (CAGR) of 3.5% from 2023 to 2030. The market is anticipated to be driven by increasing demand for trona from animal feed, air pollution control, and soda ash industries." Noting that "trona mined in the U.S. has a lower (nearly 36%) GHG footprint than Chinese synthetic soda ash" (Grand View Research 2022), projects designed to increase domestic trona production are likely to result in a net decrease in GHG emissions relative to no increase in U.S. production.	No
Soils (3.4)	Soils would be disturbed by the Project. Most of the impacts would occur within a block group that does not meet the criteria for a low-income, minority, or Tribal community. No human health effects are expected to result from disturbance of soils.	No
Groundwater resources (3.5)	Material impacts to groundwater quality and quantity are not anticipated. No human health impacts are expected.	No
Surface water resources (3.5)	Material impacts to surface water quality and quantity are not anticipated. No human health impacts are expected.	No
Geology and mineral resources (3.6)	The primary concern is subsidence within the footprint of the mine. This would be mitigated by the Applicant, if appropriate. Subsidence would not occur within any block groups that meet one or more criteria for a low-income, minority, or Tribal community.	No
Cultural resources (3.7)	Despite planned mitigation efforts, there would be unavoidable, permanent, and irreversible adverse impacts to cultural resources and resources and places of Tribal significance. Such impacts would affect members of low-income, minority, and Tribal communities, specifically Tribal members and/or persons of indigenous heritage.	Yes
Paleontological resources (3.8)	Despite planned mitigation efforts, there would be unavoidable, permanent, and irreversible adverse impacts to paleontological resources.	No
Vegetation resources (3.9)	There would be 6,481 acres of disturbance to native plant communities along with the potential introduction or spread of noxious and invasive species.	No
Wetlands (3.10)	Permanent impacts to jurisdictional wetlands would require permitting and mitigation. Wetlands may be temporarily impacted by dust, runoff, or unpanned releases.	No
Fisheries and aquatic resources (3.11)	Temporary surface disturbance and related runoff may temporarily and adversely impact fisheries and aquatic resources during Project construction. No significant impact to fisheries or aquatic resources is expected during Project operations.	No

Resource (EIS Section)	Primary Conclusions	Adverse Impact to Low-Income, Minority, or Tribal Communities
Wildlife resources (3.12, 3.13)	6,484 acres of disturbance to native habitat would occur. Landscape-level shifts in species distribution and/or viability are not anticipated.	No
Livestock and grazing (3.14)	Approximately 0.52% of the total AUMs available in the analysis area would be affected.	No
Health and human safety/hazardous materials (3.15)	Human exposure to sodium carbonate particles, mining solution, and/or brine liquids could result from discharges, spills, or leaks both on-site and along the linear features of the Project (rail line and water supply line). Because members of low-income, minority, and Tribal communities often have higher pre-existing health conditions and/or are more sensitive to pollutants, any adverse impacts from unanticipated leaks or discharges could affect members of low-income, minority, and Tribal communities. In addition, most residences located near these linear features are within block groups that meet one or more criteria for a low-income, minority, or Tribal community. Appendix M of the Mine Plan (which is Appendix C of the EIS) is a Spill Prevention, Control, and Countermeasures (SPCC) Plan. The SPCC Plan lists BMPs and measures to be taken in the event of an unanticipated discharge, spill, or leak.	Potentially (if there are unanticipated spills or leaks)
Lands and realty (3.16)	The presence of existing land use authorizations within the Project footprint would require coordination between BLM lands and realty staff and existing ROW holders. The presence of Project infrastructure may preclude or limit future development and ROWs.	No
Recreation (3.17)	Dispersed recreational activities, such as hunting, OHV use, hiking, and driving on scenic byways within viewing distance of the Project may be adversely impacted through changes in air quality and visual resources. Members of low-income, minority, and Tribal communities, particularly those with lower incomes, might have less ability to avoid or mitigate these impacts (e.g., by recreating in areas farther away) compared to the general population. Therefore, this impact would adversely affect members of low-income, minority, and Tribal populations.	Yes
Socioeconomics (3.18)	Both beneficial and adverse socioeconomic impacts are anticipated. The main beneficial socioeconomic impacts include increases in employment and income in Sweetwater County, as well as increased government revenue, which would fund additional public services. Increases in employment and income would be highest during construction and modest during operations, while increases in taxes would occur over the entire life of the Project. As low-income, minority, and Tribal communities are more likely to rely on public services than the general population, increased funding of public services through additional taxes is potentially a benefit to low-income, minority, and Tribal communities. There are three main types of adverse socioeconomic impacts of interest for low-income, minority, and Tribal communities. First, temporary increases in the local population during construction would lead to increased traffic, increased demand for and potential strain on temporary housing and lodging supply and public services. Members of low-income, minority, and Tribal communities tend to have less flexibility to adjust to these types of impacts relative to the general population because of income limitations, less ability to adjust work locations or schedules, and other factors. Therefore, these impacts would likely affect members of low-income, minority, or Tribal communities. Second, adverse impacts to natural and cultural resources, visual resources, and other resources would result in a decrease in public value for those resources. Some of these impacts would be permanent. Tribal members and/or persons of indigenous heritage are likely to experience a higher change in value of natural and cultural resources than the general population due to cultural and/or spiritual connections to the resources. These impacts are therefore considered adverse from the perspective of low-income, minority, and Tribal communities. Third, adverse impacts to natural resources that are used by Tribal members and/or persons of indigenous heritage for subsistence, medicinal, cultural, spiritual, or other uses would result in adverse impacts to members of a Tribal community.	Yes

Resource (EIS Section)	Primary Conclusions	Adverse Impact to Low-Income, Minority, or Tribal Communities
Travel and transportation (3.19)	WY 374 from Cedar Mountain Road to I 80/US 30 would experience a 943% increase in traffic volume. The rail line and access road would require a new grade-separated crossing over I 80, and a new access road would be constructed at a new intersection with WY 374 along the proposed rail line. Impacts such as increased travel times and disturbances are expected to be temporary and limited to the construction phase at these points. Members of low-income, minority, and Tribal communities, particularly those with lower incomes, might have less ability to avoid or mitigate these impacts (e.g., by working from home or changing their work schedules) compared to the general population. Therefore, this impact would adversely affect members of low-income, minority, and Tribal populations.	Yes
Visual resources (3.20)	Daytime impacts would be limited by the existing landscape setting and distance to potential viewers. Impacts related to light pollution should be minimized by development of a lighting plan. Most impacts would occur around the mine site, which would be located in a block group that does not meet the criteria for a low-income, minority, or Tribal community. However, visual impacts associated with the linear features (rail line and water supply line) would terminate near residences within block groups that meet one or more criteria for a low-income, minority, or Tribal community. Therefore, there is a potential for adverse impacts.	Yes
Fire and fuels (3.21)	Impacts would be low to moderate because the habitat exhibits low burn probabilities, low suppression difficulties, and low rates of fire spread.	No

Construction

Given the information reported in Table 3.18-22, the primary concerns associated with the Project include the following:

- Adverse impacts on cultural resources
- Adverse impacts on natural resources, which decrease the public value of natural resources and may be used by persons of Tribal membership or heritage for subsistence, medicinal, cultural, or spiritual purposes
- Adverse impacts on recreation, traffic, and visual resources that are likely to affect members of low-income, minority, and Tribal communities, particularly those with lower incomes
- Potential unanticipated human health impacts due to leaks or spills near the rail line or water supply pipeline, despite there being plans in place to prevent, control, and/or mitigate such leaks or spills

Operations

The primary types of concerns associated with Project operations would be similar to those for Project construction, with the exception of traffic impacts, which are not expected to occur during operations. The magnitudes of impacts such as visual resources and impacts to fish and wildlife are anticipated to be lower during Project operations than Project construction, especially along the linear features of the Project. Some impacts, such as irretrievable and permanent impacts to cultural resources, would be the same for Project operations and Project construction.

Mitigation Measures

Pacific Soda is committed to minimizing environmental effects during construction, operations, and reclamation of the proposed Project through implementation of Applicant-committed design features, which are shown in Section 7.17 of the Mine Plan (Appendix C, Table 7-6). In addition to these design features, other required management, BMPs, standard operating procedures, required design features, and mitigation guidelines included in the Kemmerer RMP, Rock Springs RMP, and the Ashley LMP would also apply to the Project (Appendix D). The Mine Plan (Appendix C) contains a Spill Prevention, Control, and Countermeasures (SPCC) Plan, which lists BMPs and measures to be taken in the event of an unanticipated discharge, spill, or leak. Finally, each section of this EIS considers potential mitigation measures for potentially affected resources as appropriate. Combined, these mitigation measures reduce both the likelihood and potential severity of any adverse impacts accruing to resources, the general population, and members of low-income, minority, and Tribal communities. No additional mitigation measures specifically to address members of low-income, minority, and Tribal communities are necessary or proposed at this time.

3.18.2.4 *Alternative C*

The socioeconomic impacts under Alternative C are expected to be essentially the same as those under Alternative B, except as discussed below.

Agriculture and Grazing

The number of livestock grazing AUMs impacted would be higher under Alternative C than Alternative B. An estimated 253 permitted AUMs would be impacted under Alternative C, which is 1.30% of the permitted AUMs in the livestock grazing analysis area (Section 3.14).

Table 3.18-23 summarizes changes in economic indicators for the livestock industry associated with impacts to AUMs, under the assumption that the impacted AUMs would be lost and could not be made up on lands elsewhere in the county.

Table 3.18-23. Economic Impacts to the Grazing Industry

Statistic	Cattle	Sheep	Total
Jobs per thousand AUMs	0.709	0.951	N/A
Earnings per AUM (2023 \$)	\$34.47	\$10.09	N/A
Total economic impact per AUM (2023 \$)	\$111.34	\$73.28	N/A
Livestock inventory (2017)	21,554	5,754	27,308
Reduction in Permitted AUMs *	199.7	53.3	253.0
Reduction in jobs	0.1416	0.0507	0.1923
Reduction in earnings (2023 \$)	\$6,883.70	\$537.80	\$7,421.50
Reduction in total economic impact (2023 \$)	\$22,234.60	\$3,905.80	\$26,140.40

* AUMs allocated across cattle and sheep based on their relative livestock inventories.

Source: BLM (2008); Bureau of Labor Statistics CPI calculator.

Note: N/A = not applicable

3.18.2.5 Alternative D (Preferred Alternative)

The socioeconomic impacts under Alternative D are expected to be essentially the same as those under Alternative B, except as discussed below.

Employment, Income, and Economic Output

Alternative D's estimated impacts on employment, income, and economic output are generally similar to those associated with Alternative B. As was the case for Alternative B, construction was modeled based on expected Project-related labor and non-labor expenditures provided by the Applicant. Operations were modeled on an annual basis, using the projected average production of trona.

Table 3.18-24. Summary of Economic Impact Analysis for Planning Model Inputs for Alternative D

Input Category	Total during Construction (\$)	Annual during Operations (\$)	Local Proportion during Construction (%)	Local Proportion during Operations (%)
Labor expenditures	\$1,997,873,158	N/A	15%	90%
Non-labor expenditures	\$3,022,876,952	N/A	5%	100%
Annual value of output (soda ash and bicarbonate)	N/A	\$873,376,000	N/A	N/A

Note: N/A = not applicable

Construction

During construction, it is estimated that 15% of the workforce would be Sweetwater County residents and 5% of spending on equipment and materials would occur within the county. This direct employment and spending would stimulate local economic activity. Additionally, as non-local workers commute into the

Project area, they would spend money on goods and services, such as lodging, food, and fuel for their personal vehicles.

Table 3.18-25. Summary of Economic Impact Analysis for Planning Model Results During 4-Year Construction Period

Impact Category	Industry Output (\$)	Value Added (\$)	Earnings (\$)	Employment
Direct	\$897,824,711	\$532,975,683	\$406,284,025	9,269
Indirect	\$149,801,634	\$71,412,476	\$45,091,137	918
Induced	\$174,229,803	\$99,968,563	\$44,305,806	1,139
Total	\$1,221,856,148	\$704,356,722	\$495,680,968	11,326

Table 3.18-26. Top 10 Affected Industries During the 4-Year Construction Period

Rank (by estimated industry output growth)	Industry	Total Change in Industry Output	Change in Earnings	Change in Employment
1	Construction	\$488,746,070	\$297,161,282	4,622.4
2	Accommodation and food services	\$435,242,721	\$110,950,762	5,038.3
3	Real estate and rental	\$73,046,714	\$2,061,413	177.3
4	Retail trade	\$46,383,934	\$14,482,895	454.9
5	Wholesale trade	\$30,364,222	\$7,120,208	92.4
6	Utilities	\$23,403,352	\$3,540,218	19.8
7	Transportation and warehousing	\$17,377,492	\$6,289,383	107.1
8	Health care and social assistance	\$16,858,996	\$8,291,077	197.3
9	Administrative and support and waste management and remediation services	\$15,980,167	\$5,489,039	143.5
10	Finance and insurance	\$15,475,995	\$3,172,667	70.9

Note: This table includes all impacts (direct, indirect, and induced).

During construction of the Project, the construction industry would have the largest increase in industry output and the second-most increase in employment. The other industries in the Top 10 are considered service industries. Excluding construction, the total change in employment is estimated to be an increase of 6,302, with most of that increase expected in the accommodations and food service industries. Compared to the employment statistics in Table 3.18-4, this represents a 44% increase in employment among service-related industries during construction.

Operations

Table 3.18-27. Summary of Economic Impact Analysis for Planning Model Results During the 31-Year Operational Period (annual impacts)

Impact Category	Industry Output	Value Added	Earnings	Employment
Direct	\$911,855,713	\$374,109,531	\$138,364,466	767.4
Indirect	\$205,569,064	\$96,264,935	\$51,033,236	695.9
Induced	\$67,399,831	\$38,673,133	\$17,116,711	441.0

Impact Category	Industry Output	Value Added	Earnings	Employment
Total	\$1,184,824,608	\$509,047,599	\$206,514,413	1,904.3

Table 3.18-28. Top 10 Affected Industries During the 31-Year Operational Period (annual impacts)

Rank (by estimated industry output growth)	Industry	Total Change in Industry Output (\$)	Change in Earnings (\$)	Change in Employment
1	Mining	\$928,428,464	\$79,931,479	789.2
2	Utilities	\$53,306,371	\$8,127,285	45.1
3	Finance and insurance	\$30,710,053	\$6,458,623	118.6
4	Real estate and rental	\$29,302,757	\$1,424,032	64.0
5	Wholesale trade	\$25,518,093	\$5,587,227	71.6
6	Transportation and warehousing	\$23,572,062	\$7,164,902	103.1
7	Construction	\$15,812,817	\$3,142,096	62.1
8	Retail trade	\$13,244,340	\$4,277,953	128.2
9	Management of companies	\$11,060,122	\$5,024,037	51.2
10	Professional – scientific and tech services	\$10,522,918	\$3,586,527	77.7

Note: This table includes all impacts (direct, indirect, and induced).

During operation of the Project, the mining industry would have the largest increase in industry output and employment. Compared to employment statistics in Table 3.18-4, employment in mining is estimated to increase by 23%. With the exception of mining and construction, the other industries in the Top 10 are considered service industries. Increases in employment for these industries is estimated to be modest.

Agriculture and Grazing

The number of livestock grazing AUMs impacted would be higher under Alternative D than Alternatives B and C. An estimated 272 permitted AUMs would be impacted under Alternative D, which is 1.40% of the permitted AUMs in the livestock grazing analysis area (Section 3.14).

Table 3.18-29 summarizes changes in economic indicators for the livestock industry associated with impacts to AUMs, under the assumption that the impacted AUMs would be lost and could not be made up on land elsewhere in the county.

Table 3.18-29. Economic Impacts to the Grazing Industry

Statistic	Cattle	Sheep	Total
Jobs per thousand AUMs	0.709	0.951	N/A
Earnings per AUM (2023 \$)	\$34.47	\$10.09	N/A
Total economic impact per AUM (2023 \$)	\$111.34	\$73.28	N/A
Livestock Inventory (2017)	21,554	5,754	27,308
Reduction in Permitted AUMs*	214.7	57.3	272.0
Reduction in jobs	0.1522	0.0545	0.2067

Statistic	Cattle	Sheep	Total
Reduction in earnings (2023 \$)	\$7,400.70	\$578.20	\$7,978.90
Reduction in total economic impact (2023 \$)	\$23,904.70	\$4,198.90	\$28,103.60

* AUMs allocated across cattle and sheep based on their relative livestock inventories.

Source: BLM (2008); Bureau of Labor Statistics CPI calculator.

Low-Income, Minority, and Tribal Populations

The main difference between Alternative D and Alternatives B and C is that the two linear features under Alternatives B and C (the rail line and long water supply line), would not be included under Alternative D. These two features terminate within 1 mile of residences in Granger and Green River that are located within block groups that meet the criteria for low-income, minority, or Tribal populations. Therefore, Alternative D would have less construction-related disturbances in these areas, some of which could affect members of low-income, minority, and Tribal communities. In addition, Alternative D would reduce the potential for impacts resulting from unanticipated spills or leaks near these linear features.

3.18.2.6 Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity

Impacts to various resources are discussed in other sections. No irretrievable or irreversible impacts to general socioeconomic conditions are anticipated to result from any of the alternatives. Land available for grazing would be permanently reduced under all action alternatives but it would be a small reduction in the total area available for grazing in the county. There would be irreversible and irretrievable losses of some natural resources, cultural resources, and paleontological resources. The public value of these resources would therefore decline. In addition, because the reduction in public value would be higher for low-income, minority, and Tribal communities, particularly Tribal members or persons of indigenous heritage, there would be irreversible and irretrievable adverse impacts to such communities.

3.18.2.7 Cumulative Impacts

The preceding sections of this EIS already reflect the effects of past and present projects/actions combined with the Project. As such, cumulative impacts to socioeconomics and community resources are defined as occurring when a series of ongoing and/or future actions combine in such a way that they are likely to affect socioeconomic and community resources in the future. Consistent with the subsections in Section 3.18, the cumulative impact assessment considers 1) general socioeconomic indicators (population, employment and income, housing, public services, landownership, and taxes), 2) impacts to specific industries and public values (agriculture and grazing, mining, tourism and outdoor recreation, property values, and public values), and 3) impacts to low-income, minority, and Tribal populations (including cultural resources).

The majority of the projects identified in Table E-1 (Appendix E) are traffic infrastructure improvements. The primary potential for cumulative impacts associated with these projects relates to congestion/delays if work on transportation-related components of the Project overlap in space and time with construction of a WYDOT project and combine to cause significant traffic delays. Coordination between WYDOT and the Applicant would mitigate this concern.

Five of the remaining reasonably foreseeable future projects (three recreational enhancements, a paleontological excavation, and installation of a fiber optic line) are unlikely to result in any significant cumulative impacts.

The three remaining projects, all of which have identified the BLM as the lead agency, include two trona mines and the Sweetwater Carbon Storage Hub Project. These projects may compete with the Project for laborers; the increase in labor demand could increase local wages among individuals with mining-related skillsets and result in increased in-migration. This, in turn, would increase the cost of accommodations, increase demand for public services, and generate government revenue. Although significant impacts to agriculture and grazing, tourism and outdoor recreation, property values, and public values are unlikely, the simultaneous operation of three trona mines could result in a supply increase that ultimately depresses market prices. Simultaneous operation would also increase the probability of adverse impacts among low-income, minority, and Tribal communities as a result of changes in air quality and/or viewsapes.

3.19 Travel and Transportation

The Project area is located south of I 80 and west of WY 530, between Granger and Green River, Wyoming. The analysis area for transportation is the public roadways and intersections that are proposed to be used during construction, operations, and/or reclamation of the Project or alternatives. This area was chosen because it includes the roadways that would be affected by Project-related disturbance and traffic (Appendix Q, Figure 3.19-1).

3.19.1 Affected Environment

The following interstate and U.S. highways are located within the analysis area (Appendix Q, Figure 3.19-1):

- **I 80 from mile point (MP) 60 to MP 93:** I 80, which is collocated with US 30 for more than 24 miles within the analysis area, consists of two eastbound and two westbound lanes separated by a median. The interstate serves the general public and trucks hauling goods between the western and midwestern United States (WYDOT 2013). I 80 has grade-separated interchanges at WY 374/Cedar Mountain Road; US 30; the town of Little America, which provides another access point to WY 374 and points east; Tenneco Road; WY 372; Covered Wagon/Gaensslen Road; and at I 80/US 30 Business both north and south of the City of Green River. Most grade-separated interchanges along I 80 also provide access to WY 374. The Union Pacific Railroad crosses over I 80 via a bridge west of Lozier Ranch Road; another branch of the rail line passes under the interstate via two-lane bridges southwest of the WY 372 interchange.
- **I 80/US 30 Business (Flaming Gorge Way, MP 89 to MP 92):** Flaming Gorge Way provides an alternative to I 80 through the City of Green River. For most of its length, it consists of two travel lanes (one westbound and one eastbound) with on-street parking to either side. Periodically, the highway consists of one westbound travel lane, one eastbound travel lane, and a central turn lane. Most intersections along I 80/US 30 Business are unsignalized.
- **US 30 from MP 95 to MP 100:** US 30 is the only U.S. highway within the analysis area. South of the Town of Granger, US 30 consists of one northbound lane and one southbound lane. The roadway widens to include a right-turn/exit lane approaching WY 374, then separates farther to include two lanes in each direction between WY 374 and the I 80 interchange.

The following Wyoming state highways are located within the analysis area (Appendix Q, Figure 3.19-1):

- WY 372 (La Barge Road) (MP 0 to points north) is a two-lane, north-south state highway.
- WY 374 is a discontinuous state highway that runs parallel to I 80 on either the north or south. The segment of WY 374 to be analyzed is along the westbound side of I 80 between Cedar Mountain Road and US 30 from MP 61.6 to MP 66.4. The highway follows US 30 southbound

and terminates at an unsignalized, at-grade intersection that provides access to US 30 in both directions.

- WY 530 (MP 0 to 20) is a three- to five-lane, north-south highway running from its northern terminus at Flaming Gorge Way in Green River to the Utah state line. Only major intersections within Green River are signalized. South of Green River, WY 530 connects to the Flaming Gorge Reservoir, a hub for fishing and other outdoor recreation. Sweetwater County and the City of Green River share legal access to the Green River Airport via a ROW from WY 530 at roughly MP 5.5.

The following county and local roads are within the analysis area:

- Tenneco Road (County Road 85), which also provides access to the American Soda trona mining facility.
- Cedar Mountain Road, a WYDOT-maintained paved access road parallel to I 80 to the south and accessible via I 80 at Exit 61.

Annual average daily traffic (AADT) is a measure used primarily in transportation planning, transportation engineering, and retail location selection. AADT is defined as the total volume of vehicle traffic passing through a segment of highway or road in both directions per year divided by 365 days (Barr Engineering 2022). The WYDOT provides 2021 and 2022 AADT counts for general traffic for key roadway segments within the analysis area (Table 3.19-1) (WYDOT 2022a).

Table 3.19-1. 2021 Annual Average Daily Traffic for Major Road Segments within the Analysis Area

Route	From Mile Point	To Mile Point	Roadway Segment Description	Total AADT (2022)	Truck AADT (2022)
I 80	61.6	66.2	I 80 from WY 374/Cedar Mountain Road interchange to US 30 interchange	13,341	7,763
I 80	66.2	69.5	I 80 from US 30 interchange to Little America/WY 374 interchange	14,948	7,778
I 80	69.5	72.3	I 80 from Little America/WY 374 interchange to Tenneco Road interchange	14,653	7,517
I 80	72.3	82.7	I 80 from Tenneco Road interchange to WY 372	15,481	7,794
I 80	82.7	85.7	I 80 from WY 372 to Covered Wagon/Gaensslen Road (eastbound)	15,481	7,794
I 80	85.7	89.5	I 80 from Covered Wagon/Gaensslen Road to I 80/US 30 Business (west interchange)	17,063	8,152
I 80	89.5	91.5	I 80 from I 80/US 30 Business (west interchange) to I 80/US 30 Business (east interchange)	17,118	7,821
I 80	91.5	93+	I 80 from I 80/US 30 Business (east interchange) to points west	24,731	8,037
I 80/US 30 Business	89.5	91.2	I 80/US 30 Business from I 80 (west interchange) to WY 530	8,011	279
I 80/US 30 Business	91.2	92	I 80/US 30 Business from WY 530 to I 80 (east interchange)	9,408	312
US 30	95	100	US 30 from I 80 interchange north	1,770	689
WY 530	0	0.5	WY 530 from I 80/US 30 Business to East 2nd Street South	9,819	1,090

Route	From Mile Point	To Mile Point	Roadway Segment Description	Total AADT (2022)	Truck AADT (2022)
WY 530	0.6	1.5	WY 530 from East 2nd Street South to Riverview Drive/Astle Avenue	19,313	1,090
WY 530	1.5	2.0	WY 530 from Riverview Drive/Astle Avenue to Shoshone Avenue	17,226	1,090
WY 530	2.0	2.7	WY 530 from Shoshone Avenue to Green River town boundary	5,771	525
WY 530	2.7	19.5	WY 530 from Green River town boundary to McKinnon Road	2,036	179
WY 372	0	12+	WY 372 from WY 374 to points north	1,627	298
WY 374	61.6	66.4	WY 374 from Cedar Mountain Road interchange to I 80/US 30	81	25
Tenneco Road			Tenneco Road	697	Not available

Source: WYDOT (2022a).

Based on recent trends and future population projections within Sweetwater County, Green River, and Rock Springs, the population within the analysis area is expected to decline slightly by 2040 (ABT Associates 2021). Recent trends that are expected to continue into the near future include increased travel and tourism, the increased demand and expansion of renewable energy resources such as wind and solar farms and the associated transportation needs, increasing costs due in part to oil price increases, growing demand for transportation alternatives at the local level, and funding instabilities (WYDOT 2010).

WYDOT plans for future short-term trends in transportation demand via the Wyoming Statewide Transportation Improvement Program (STIP), which represents the planned construction, preliminary engineering, and costs for all planned transportation projects for up to 6 years in the future. The current STIP includes the years 2022 through 2027. Planned projects in the STIP for the analysis area include pavement rehabilitation and maintenance projects along I 80, WY 374, and WY 530.

WYDOT also implements *Wyoming Connects: The Long Range Transportation Plan* (WYDOT 2010) (Long Range Transportation Plan), which uses a systematic approach to analyze the state's transportation needs, identify issues and problems, and address revenues and programming through 2035. The Long Range Transportation Plan also includes separate plans for 16 state significant corridors, defined as high-volume multimodal routes that connect major cities, towns, and activity centers to each other both within and outside Wyoming (WYDOT 2022b). The analysis area occurs along the WYDOT-designated Evanston to Cheyenne Corridor (Corridor 1). Due to funding availability, the Long Range Transportation Plan and the Corridor 1 Plan (WYDOT 2013) focus primarily on maintenance and repairs of existing systems rather than new capital improvements. A wide range of improvements are recommended along I 80 and its intersecting roads, primarily to address identified deficiencies in safety and mobility (WYDOT 2010). Recommendations include additional accommodations for trucks, such as additional truck lanes, passing lanes, bridge upgrades and replacements, and interchange improvements.

3.19.2 Environmental Consequences

3.19.2.1 Analysis Method

The impact indicator for transportation is the percentage increase in vehicle trips per day on public roadways compared to existing AADT.

The following assumptions apply to this analysis:

- The analysis includes only construction and operational trips that would occur on public roadways outside the mine permit boundary. Applicant construction and operational trips within the mine permit boundary do not involve public roadways and do not impact public transportation flow. Therefore, they are not included in this analysis.
- Construction, operations, and reclamation may happen concurrently in different areas.
- Non-motorized travel would be negligible in the Project area and has been excluded from this analysis.

3.19.2.2 *Alternative A (No Action)*

Under the No Action Alternative, no additional expansion onto BLM- or USFS-administered lands would occur. No construction would occur, and there would be no additional vehicle or truck traffic on public roadways; therefore, there would be no impacts to transportation resources. Existing conditions and trends in the analysis area would continue as described in the Affected Environment section above.

3.19.2.3 *Alternative B (Proposed Action)*

Table 3.19-2 below shows the estimated number of trips and percentage increase in trips that would occur on public roadways under each alternative during construction and operations (Barr Engineering 2022).

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Table 3.19-2. Number of Vehicle Trips and Percentage of Increase in Annual Average Daily Traffic on Public Roadways by Action Alternative

Route	From Mile Point	To Mile Point	Roadway Segment Description	Total AADT (2022)	Alternative B				Alternative C				Alternative D			
					Construction	% AADT Increase	Operations	% AADT Increase	Construction	% AADT Increase	Operations	% AADT Increase	Construction	% AADT Increase	Operations	% AADT Increase
I 80	61.6	66.2	I 80 from WY 374/Cedar Mountain Road interchange to US 30 interchange	13,341		0.0%	51	0.4%	792	5.9%	1,411	10.6%	126	0.9%	100	0.7%
I 80	66.2	69.5	I 80 from US 30 interchange to Little America/WY 374 interchange	14,948		0.0%	51	0.3%	792	5.3%	1,411	9.4%	126	0.8%	100	0.7%
I 80	69.5	72.3	I 80 from Little America/WY 374 interchange to Tenneco Road interchange	14,653		0.0%	51	0.3%	792	5.4%	1,411	9.6%	126	0.9%	100	0.7%
I 80	72.3	82.7	I 80 from Tenneco Road interchange to La Barge Road (WY 372)	15,481		0.0%	51	0.3%	792	5.1%	1,411	9.1%	126	0.8%	100	0.6%
I 80	82.7	85.7	I 80 from La Barge Road (WY 372) to Covered Wagon/Gaensslen Road	15,481		0.0%	51	0.3%	792	5.1%	1,411	9.1%	126	0.8%	100	0.6%
I 80	85.7	89.5	I 80 from Covered Wagon/Gaensslen Road to I 80/US 30 Business (west interchange)	17,063		0.0%	51	0.3%	792	4.6%	1,411	8.3%	126	0.7%	100	0.6%
I 80	89.5	91.5	I 80 from I 80/US 30 Business (west interchange) to I 80/US 30 Business (east interchange)	17,118		0.0%	51	0.3%	792	4.6%	1,411	8.2%	126	0.7%	100	0.6%
I 80	91.5	93+	I 80 from I 80/US 30 Business (east interchange) to points east	24,731		0.0%	51	0.2%	792	3.2%	1,411	5.7%	126	0.5%	100	0.4%
I 80/US 30 Business	89.5	91.2	I 80/US 30 Business from I 80 (west interchange) to WY 530	8,011		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
I 80/US 30 Business	91.2	92	I 80/US 30 Business from WY 530 to I 80 (east interchange)	9,408		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
US 30	95	100	US 30 from I 80 interchange north	1,770		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
WY 530	0	0.5	WY 530 from I 80/US 30 Business to East 2nd Street South	9,819	150	1.5%	4	0.0%	150	1.5%	4.00	0.0%	150	1.5%		0.0%
WY 530	0.6	1.5	WY 530 from East 2nd Street South to Riverview Drive/Astle Avenue	19,313	150	0.8%	4	0.0%	150	0.8%	4.00	0.0%	150	0.8%		0.0%
WY 530	1.5	2.0	WY 530 from Riverview Drive/Astle Avenue to Shoshone Avenue	17,226	150	0.9%	4	0.0%	150	0.9%	4.00	0.0%	150	0.9%		0.0%
WY 530	2.0	2.7	WY 530 from Shoshone Avenue to Green River city boundary	5,771	150	2.6%	4	0.1%	150	2.6%	4.00	0.1%	150	2.6%		0.0%
WY 530	2.7	19.5	WY 530 from Green River city boundary to McKinnon Road	2,036	150	7.4%	4	0.2%	150	7.4%	4.00	0.2%	150	7.4%		0.0%
WY 372	0	2+	WY 372 from WY 374 north	1,627		0.0%		0.0%		0.0%		0.0%	746	45.9%	1,268	77.9%
WY 374	61.6	66.4	WY 374 from Cedar Mountain Road to I 80/US 30	81	792	977.8%	1,360	1,679.0%		0.0%		0.0%		0.0%		0.0%
Tenneco Road			Tenneco Road	697*		0.0%		0.0%		0.0%		0.0%	126	18.1%	100	14.3%

Source: Pacific Soda (2022); WYDOT (2022a).
* 2021 AADT data were used because 2022 AADT data were not available for this segment.

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Alternative B proposes the use of the existing southern access road during construction, which is accessed via WY 530 north of McKinnon Road. Under Alternative B, the existing access road is anticipated to accommodate up to 75 vehicle round trips (150 total trips) a day during the 3-year construction period; anticipated vehicles include passenger vehicles, transport buses, and heavy load trucks. The 2022 AADT along WY 530 in the vicinity of the Project ranges from 2,036 to 19,313; therefore, the additional traffic generated by Alternative B would result in an 0.8% to 7.4% increase in AADT along WY 530 during construction (Table 3.19-2). During operations, the existing access road would only be used for emergency purposes; therefore, the existing AADT would be unaffected.

Under Alternative B, one new access road would be constructed at a new intersection with WY 374 along the proposed rail line to allow for transportation of mining product and operations personnel between the processing facility and the Union Pacific Railroad Evanston Subdivision Mainline. This access road is anticipated to accommodate up to 396 vehicle round trips (792 total trips) a day during construction and 680 vehicle round trips (1,360 total trips) a day during operations; anticipated vehicles include passenger vehicles, transport buses, and heavy load trucks. Given the 24-hour operation of many of the facilities, not all these trips would occur at peak times. The 2022 total AADT on this segment of WY 374 is 81; therefore, the additional traffic generated could result in a 978% increase in AADT along WY 374 during construction and a 1,679% increase in AADT during operations (Table 3.19-2). To mitigate this proportionally large increase in vehicular traffic, modifications would be made at the intersection of the access road with WY 374 to facilitate a deceleration/right-turn lane for westbound traffic and a dedicated left-turn lane for eastbound traffic, which would allow for continual traffic flow to mitigate these increases.

During operations, up to 256 silo truck trips per week (51 truck trips per day) on I 80 may be necessary to transport product to local customers in the Green River area. The 2022 AADT along I 80 in the vicinity of the Project ranges from 13,341 to 24,731; therefore, the additional traffic generated as a result of truck trips would result in less than 1% increase in AADT along I 80 during operations (Table 3.19-2).

The rail line and access road would require the construction of a new grade-separated crossing over I 80. The rail line and access road would cross I 80 at a perpendicular angle via two collocated overpass structures with similar bridge length and spans anticipated. No direct access points to I 80 would be added.

A transportation and traffic management plan would be developed under all action alternatives to address Project access points to minimize potential hazards from increased truck and worker traffic and minimize impacts to traffic flow in the vicinity of the Project. To reduce fugitive dust and minimize the risk for collisions between Project traffic and livestock or wildlife, the Applicant would set speed limits for Project traffic. This speed limit would apply to unpaved roads authorized for Project traffic. It would not apply on paved state, county, or local roads, where Project traffic would follow posted speed limits. The traffic and transportation management plan would also include BMPs to minimize temporary lane closures, detours, and subsequent delays along I 80 and other public roadways during construction of the overpasses and at-grade crossings. All crossings of roads and water features would abide by WYDOT and American Association of State Highway Transportation Officials standards for maintaining horizontal clearances and appropriate bridge approaches and slopes for both rail and vehicular traffic. The design of access roads would incorporate the roadway-specific recoverable area and design as applicable by WYDOT and American Association of State Highway Transportation Officials standards. Only approved access roads would be used for construction. Temporary access roads would be clearly marked in a way that would not confuse the public to avoid any trespass problems. The Applicant would post appropriate warning signs along Project features to deter entry to the site. The Applicant would restrict public access to the Project using “no trespassing” and other appropriate hazard warning signs posted at access roads leading to the Project. Safety signs would meet federal and state regulatory requirements.

Limited planning for the reclamation phase of the Project has been completed to date; therefore, a detailed inventory of vehicle trips for the reclamation phase is not available. Although details such as manpower requirements and equipment lists are not currently available for the reclamation phase, the activities that would occur during reclamation are expected to be similar to a subset of the activities addressed in construction and mine well field development. The Applicant would comply with the existing temporary ROW grant for reclamation of the current access road before the end of the temporary ROW. The Applicant would reclaim other access roads, the rail line, and access road corridors to their preconstruction state. The reclamation phase is expected to require less labor and equipment relative to construction; traffic impacts are expected to be similar to or slightly less than those occurring during construction (Barr Engineering 2022).

3.19.2.4 *Alternative C*

Alternative C would be similar to Alternative B except the northern access road would use the existing Cedar Mountain Road interchange on I 80 (Exit 61) and run along I 80 before turning south to be collocated with the rail line. This change would eliminate the need to construct road improvements (widening and intersection) at the intersection of WY 374 and the new access road. The number of additional vehicle trips on the access road would be similar to those discussed under Alternative B but would occur via I 80 instead of WY 374 (Table 3.19-2). The impact to WY 374 would therefore be greatly reduced or eliminated compared to Alternative B. The 2022 AADT along I 80 in the vicinity of the Project ranges from 13,341 to 24,731; therefore, the additional traffic generated would result in a 3.2% to 5.9% increase in AADT along I 80 during construction and a 5.7% to 10.6% increase in AADT during operations (Table 3.19-2).

3.19.2.5 *Alternative D (Preferred Alternative)*

Under Alternative D, the northern access road and rail line described under Alternative B would not be constructed. No improvements to WY 374 would be required and the AADT impacts along WY 374 would be substantially reduced or eliminated compared to Alternative B. Three new access roads are proposed that would be accessed via existing highways: the mine site access road, the processing facilities access road, and the water intake access road.

Under Alternative D, the Applicant would construct a paved mine site access road from Tenneco Road, which is accessed from I 80 at Exit 72. The mine site access road is anticipated to accommodate up to 63 vehicle round trips (126 total trips) a day during construction and 50 vehicle round trips (100 total trips) a day during operations; anticipated vehicles include passenger vehicles, transport buses, and heavy load trucks. These trips would represent less than 1% of AADT along I 80 in the vicinity of the Project during both construction and operations. The 2022 AADT along Tenneco Road is not available; however, based on the 2021 AADT of 697, the additional traffic generated on Tenneco Road under Alternative D would result in a 18.1% increase in AADT during construction and a 14.3% increase during operations (Table 3.19-2). Although Tenneco Road is a public roadway, its primary function is to provide access to the existing American Soda trona mining facility; therefore, the majority of traffic on Tenneco Road is expected to consist of American Soda personnel. The Applicant would coordinate trips with the American Soda facility as needed; no other impacts to public roadways due to the mine site access road are anticipated.

The Applicant would construct a paved access road from WY 372 to the processing facilities. The processing facilities would not have direct access to I 80. The processing facilities access road is anticipated to accommodate up to 333 vehicle round trips (666 total trips) a day during construction and 630 vehicle round trips (1,260 total trips) a day during operations (Table 3.19-2). The Applicant would also use an existing, graveled access road to access the proposed water intake and pump facilities via WY

372. The last approximately 75 feet of the water intake access road to the pump facility would require the construction of a new road. The water intake access road is anticipated to accommodate up to 40 vehicle round trips (80 total trips) a day during construction and four vehicle round trips (eight total trips) a day during operations. The processing facilities and water intake access roads would therefore result in a combined 746 trips per day during construction and 1,286 trips per day during operations along WY 372 (Table 3.19-2). As discussed under Alternative B, not all of these trips would occur at peak times given the 24-hour operation of many of the facilities. The 2022 AADT along WY 372 is 1,627; therefore, the additional traffic generated on WY 372 under Alternative D would result in a 46% increase in AADT during construction and a 78% increase during operations (Table 3.19-2). These impacts to WY 372 would not occur under Alternative B.

3.19.2.6 *Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity*

The widening and additional lanes proposed on WY 374 under Alternative B would not be reclaimed or restored following decommissioning of the Project, resulting in irreversible changes to WY 374. However, these irreversible changes are designed to improve transportation flow. Additionally, following decommissioning, Project-related traffic impacts to public roadways would largely cease. All other access roads and the rail line would be decommissioned and reclaimed to their preconstruction state. Under Alternatives C and D, no irretrievable or irreversible impacts to transportation would occur.

3.19.2.7 *Cumulative Impacts*

RFFAs listed in Appendix E with the potential to result in cumulative impacts to travel and transportation include any projects, such as trona mining development, that would add additional traffic to the roadway network during construction and operations, as well as projects that would impact traffic flow during construction. The amount of additional vehicle traffic that would be generated as a result of future mining projects, the roads that would be affected, and any associated roadway capacity improvements that may be required are unknown at this time. However, if the increased truck and worker traffic resulting from these RFFAs is similar to the proposed Project, then there would be a cumulative impact to traffic volumes on local roadways. The RFFAs involving pavement maintenance and roadway and bridge improvements may result in temporary lane closures, detours, and subsequent delays that would cumulatively affect traffic in the analysis area. The construction of the WY 374 modifications, the crossing over I 80, and other roadway crossings under the Proposed Action would require similar temporary traffic disruptions; however, these impacts would be temporary and only last for the duration of construction activities. If other RFFAs are under construction at the same time and location as the Proposed Action, or immediately before or after, then there could be a temporary cumulative effect on traffic flow. However, this cumulative effect would be mitigated by the traffic and transportation management plan for the Project and other Project-specific traffic management plans as required by both county and federal regulations.

3.20 Visual Resources

The term *visual resources* refers to the composite of basic terrain, geological and hydrological features, vegetative patterns, and built features that influence the visual appeal of a landscape. The BLM uses its VRM system to classify and manage visual resources on lands under its jurisdiction. The VRM system involves inventorying scenic values, establishing management objectives for those values through the resource management planning process, and then evaluating proposed activities to determine whether they conform to the management objectives (BLM 1984). The BLM's VRM system incorporates scenic quality, viewer sensitivity, and distance zones to identify Visual Resource Inventory (VRI) classes. These

classes represent the relative value of the existing visual landscape, as well as the visual resource baseline from which to measure impacts that a proposed project may have on these values. In its planning process, the BLM weighs visual and competing resource values and designates VRM Classes I through IV and associated management objectives for a given area's visual setting. The Rock Springs RMP has established the portion of the Project area within the RSFO as VRM Class IV, and the Kemmerer RMP has established the portion of the Project area within the KFO as VRM Class IV for the Project area.

Based on existing land uses within the Project area, information from the Kemmerer and Rock Springs VRI (BLM 2017) informs VRM. Accordingly, to ensure accurate disclosure of impacts, this visual resource analysis will focus on Project impacts compared with the baseline existing landscape and visual conditions in the Project area.

A portion of the Project (water pipeline) would occur on USFS land. This land is within the Ashley National Forest and is managed under the Ashley LMP. The USFS uses the Scenery Management System to assess and manage visual and aesthetic resources on lands under its management. The Scenery Management System is used to systematically determine the relative value of scenery on National Forest System lands (USFS 1995). The process involves identifying scenic components as they relate to people, mapping the components, and assigning a value for aesthetics. The value of aesthetics is described with a Scenery Integrity Objective (SIO), which defines the limits of development that can take place within a SIO. The USFS lands where the Project would cross have been assessed as SIOs of high and moderate.

3.20.1 Affected Environment

3.20.1.1 Visual Resource Inventory Process

Existing visual conditions (i.e., values) relate to the components of the landscape, both natural and human-made, that contribute to the overall visual character associated with an area of land. These conditions are documented as part of the BLM VRI process. The information collected during this process provides descriptions and analysis of the landscape and viewer sensitivity that can be associated with the Project and is broken down into three categories: scenic quality, visual sensitivity, and distance zones (BLM 1986a). The overall VRI class is then determined based on those three categories and given an overall rating to inform the VRM classes and objectives. The Rock Springs VRI (BLM 2011) identifies the Project area as having a lower average scenic quality (scenic quality Classes B and C) and low visual sensitivity (Appendix Q, Figures 3.20-1–3.20-4). The VRI classes occurring within the visual analysis area are Classes II, III, and IV (Appendix Q, Figure 3.20-1).

3.20.1.2 Scenic Quality

A scenic quality evaluation measures the visual appeal of a landscape. Public lands are rated as Class A (19 points or more), Class B (12–18 points), or Class C (11 points or less) areas based on the apparent scenic quality. Lands are reviewed and rated using seven key factors, and the total score determines the rating (BLM 2011). The seven key factors are landform, vegetation, water, color, influence of adjacent scenery, scarcity, and cultural modifications. This review is done systematically by dividing the landscape into Scenic Quality Rating Units (SQRUs) based on conspicuous changes in physiography or land use and ranking scenic quality within each SRQU based on these seven factors.

SQRUs within the visual analysis area are shown on Figure 3.20-2 (Appendix Q). Areas with a scenic quality rating of A (high scenic quality) are on the eastern side of the analysis area oriented north-south (Green River Valley SRQU). Areas with a scenic quality rating of B (moderate scenic quality) are found on the very eastern edges of the analysis area and one area where the Green River cuts through the analysis area (White Mountain, Firehole Canyon, and Blacks Fork River SQRUs). Areas with a rating of C (low

scenic quality) occur in the southern, western, and extreme eastern portions of the analysis area (Appendix Q, Figure 3.20-2). The majority of the analysis area is rated as a SQRU Class C. The proposed ROWs are in areas with a scenic quality rating of C with the exception of crossing an area rated as a scenic quality of A along the Green River. Common traits for the ROWs include a generally flat plain with a subtle slope and soft undulations that form drainage patterns toward the Blacks Fork River with broad views of surrounding low-laying hills. Vegetation for the Class C landscape is a mix of sagebrush and low grasses with seasonal color and similar texture throughout. The Blacks Fork River floodplain has taller and denser vegetation with more seasonal color and variety of texture. The analysis area contains evidence of industrial development related to the mining and oil/gas industry, as well as small pockets of urban development (Little America to the west and a residential community to the east).

3.20.1.3 Sensitivity Level Rating Units

Visual sensitivity reflects attitudes and perceptions held by people regarding the landscape and generally reflects the public's level of sensitivity to noticeable changes to the landscape. Visual sensitivity ratings range from high sensitivity (i.e., the public is highly aware of incremental changes in the subject landscape) to low sensitivity (i.e., the public has little concern of changes in the subject landscape). Sensitivity Level Rating Units (SLRUs) within the visual analysis area are shown on Figure 3.20-3 (Appendix Q). Generally, attitudes to changes in the landscape range from high to moderate in the analysis area based on VRI data.

3.20.1.4 Distance Zones

The BLM defines distance zones as *foreground/middleground* (from a distance of 3 to 5 miles), *background* (from a distance of 3 to 5 miles to a maximum of 15 miles based on atmospheric conditions), and *seldom seen* (portions of the landscape that are not visible or distances greater than 15 miles). These definitions are used as a framework for contrast analysis. The contrast analysis assesses the level of visual change associated with the Project and evaluates the fundamental design elements (form, color, texture, and scale) and the influence of environmental factors that can influence the level of contrast based on the casual viewer's perspective and distance. Visual distance zones within the visual analysis area are shown on Figure 3.20-4 (Appendix Q). The most common distance zone within the analysis area is the foreground/middleground. Generally, the Project would be visible in the foreground/middleground and background distance zones. Scattered areas identified as seldom seen are present within the analysis area, and Project components would not be visible in these areas.

3.20.1.5 Visual Resource Inventory Classes

VRI Classes II, III, and IV occur within the visual analysis area (Appendix Q, Figure 3.20-1).

National Historic Trails

This section provides a base description of the NHTs that contain visual and cultural importance within the visual analysis area. Four designated NHTs (California, Pony Express, Oregon, and Mormon Pioneer) occur within the analysis area and are managed under the 1999 Comprehensive Management and Use Plan (NPS 1999) (Appendix Q, Figure 3.20-5).

Oregon National Historic Trail

The Oregon NHT was established in 1978 and is administered by the NPS. An amended comprehensive plan (NPS 1999) includes the trail's purpose and significance. The purpose of the trail is to 1) identify, preserve, and interpret the sites, route, and history of the Oregon Trail for all people to experience and

understand and 2) to commemorate the westward movement of emigrants to the Oregon Country as an important chapter of our national heritage. The trail is significant for the following reasons:

- 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 United States. Federal protection components identified in the 1999 Comprehensive Management and Use Plan (NPS 1999) include high potential segments, high potential sites, and the auto tour route.
- It is a symbol of American westward traditional migration embodied in traditional concepts of pioneer spirit, patriotism, and rugged individualism.
- It strengthened the United States' claim to the Pacific Northwest (NPS 1999).

As described in the 1999 Comprehensive Management and Use Plan (NPS 1999), a national ROW has not yet been established for the Oregon NHT. Recreation for the trail, as contained in the plan, includes historical 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 public, and visiting associated museums and education facilities along the route. Federal protection components identified in the 1999 Comprehensive Management and Use Plan (NPS 1999) include high potential segments, high potential sites, and the auto tour route.

California National Historic Trail

The California NHT was established by Congress in 1992 and is administered by the NPS. The 1999 Comprehensive Management and Use Plan (NPS 1999) describes the trail's purpose and significance. The purpose of the trail is to 1) enable all people to envision and experience, in a coherent and convenient way, the heritage and impacts of the western overland migration and 2) encourage preservation of its history and physical remains. The California NHT is significant because 1) it is one of the major highways of the nineteenth century, which provided a 2,400-mile path for emigrants to the west, and their resulting settlement significantly contributed to change in peoples, cultures, and landscapes; 2) one of the largest overland migrations in American westward expansion used the trail as a result of the California gold rush; and 3) 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. Recreational opportunities for the trail would be the same as the Oregon NHT. Federal protection components identified in the 1999 Comprehensive Management and Use Plan include high potential segments, high potential sites, and the auto tour route.

Oregon and California National Historic Trails Auto Tour Route

In cooperation with state departments of transportation, auto tour routes have been established and are marked along the existing roadway systems, consistent with the provisions of the National Trails System Act and existing state plans. The purpose of the routes is to heighten public awareness of the trails and to stimulate interest in visiting actual trail sites, segments, and interpretive facilities (NPS 1999). The Oregon and California NHTs Auto Tour Route occurs within the analysis area (WY 374).

Mormon Pioneer National Historic Trail

The Mormon Pioneer NHT was established in 1978 and is administered by the NPS. The 1999 Comprehensive Management and Use Plan (NPS 1999) describes the trail's purpose and significance. The

purpose of the trail is to 1) identify and preserve the sites, route, and history of the Mormon Pioneer Trail for all people to experience and understand; and 2) 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 1) the trail was used by cohesive Mormon companies seeking religious freedom with the intent of locating their new Zion in the Far West; 2) 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; 3) the trail was part of the westward movement that provided an improved route into the Great Basin; and 4) the Mormons, in using the trail in both directions, improved the route into the Great Basin (NPS 1999).

Pony Express National Historic Trail

The Pony Express NHT was established by Congress in 1992 and is administered by the NPS. The purpose of the trail is to 1) identify and preserve the sites, route, and history of the Pony Express for all people to experience and understand and 2) commemorate the rapid mail delivery that linked eastern and western states. The trail is significant because 1) the Pony Express proved the viability of a central United States overland communication system and was a forerunner of the transcontinental telegraph and railroad; 2) the Pony Express required organizational skills to join the populous East and the West; 3) 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; 4) 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 and allowed westerners to develop and maintain a sense of contact with the eastern United States at a critical time in United States history; 5) 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; and 6) the lone riders and isolated stations became a lasting image of the West. Recreational opportunities for the trail would be the same as the Oregon NHT. Federal protection components identified in the 1999 Comprehensive Management and Use Plan (NPS 1999) include high potential segments, high potential sites, and the auto tour route.

For more information about the cultural importance of NHTs, refer to Section 3.7.

3.20.1.6 *Regulatory Framework*

Federal Land Policy and Management Act

The FLPMA, as amended (43 USC 1701; Public Law 94-579), consolidates and articulates BLM and USFS management responsibilities and governs most uses of federal lands, including authorization to grant or renew ROWs. In accordance with the FLPMA, the BLM and USFS must make land-use decisions based on the principles of multiple use and sustained yield. As such, a ROW grant must be limited to its necessary use and must contain terms and conditions that reflect the agencies' management responsibilities under the FLPMA, including minimizing impacts on fish and wildlife habitat.

National Landscape Conservation System

The National Landscape Conservation System (16 USC 7201–7203) was established in 2000 by a U.S. Department of the Interior Secretarial Order “in order to conserve, protect, and restore nationally significant landscapes that have outstanding cultural, ecological, and scientific values for the benefit of current and future generations.” The National Landscape Conservation System was made permanent and codified in the Omnibus Public Land Management Act - Public Resource Protection (Public Law 111-11, Title II). The system includes the following, all of which are administered by the BLM: national

monuments, national conservation areas, wilderness, wilderness study areas, wild and scenic rivers, national scenic and historic trails, cooperative management and protection areas, outstanding natural areas, and forest reserves.

National Historic Preservation Act

The NHPA of 1966, as amended (54 USC 300101 et seq.; 36 CFR 800), directs federal agencies to consider the effects of their actions on historic properties and provide the Advisory Council on Historic Preservation a reasonable opportunity to comment.

Bureau of Land Management

Visual Resource Management Classes

VRM classes and objectives are assigned through RMPs. The assignment of VRM classes is ultimately based on the management decisions made in RMPs; however, visual values must be considered throughout the RMP process using the information collected during the VRI process. VRM decisions in the RMP should reflect the value of visual resources documented. The Project area is managed by both the Rock Springs RMP and Kemmerer RMP.

VRM objectives for the Rock Springs RMP are defined as follows:

- **Class I objective:** The objective of this class is to 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 to the characteristic landscape should be very low and must not attract attention.
- **Class II objective:** The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen but should not attract the 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 objective:** The objective of this class is to partially retain the existing character of the landscape. The level of change 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 objective:** The objective of this class is to provide for management activities that require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention.

VRM objectives for the Kemmerer RMP are defined as follows:

- **Class I objective:** To preserve the existing character of the landscape. The level of change to the character landscape must be very low and must not alter or attract attention.
- **Class II objective:** To retain the existing character of the landscape. The level of change to the characteristic landscape must be low.
- **Class III objective:** To partially retain the character of the landscape. The level of change to the characteristic landscape must be moderate.

- **Class IV objective:** To provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high.

The Rock Springs RMP establishes Class IV for the Project area (BLM 2024c) (Table 3.20-1). Based on existing land uses within the Project area, information from the Kemmerer and Rock Springs VRI (BLM 2017) informs the VRM. The Kemmerer RMP, as amended, establishes that the Project area is VRM Class IV (BLM 2010a). RMP VRM class objectives are applicable to the general area near the Project area. Accordingly, to ensure accurate disclosure of impacts, this visual resources analysis focuses on Project impacts when compared with the baseline existing landscape and visual conditions in the Project area (Appendix Q, Figure 3.20-5).

Table 3.20-1. Total Number of Acres per Visual Resource Management Class within the Analysis Area

Visual Resource Management Classes	Acres in Visual Analysis Area
IV	271,417

Bureau of Land Management Manual 6280

BLM Manual 6280 – Management of National Scenic and Historic Trails and Trails Under Study or Recommended as Suitable for Congressional Designation (Public) (BLM 2012b) 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; inventory, planning, management, and monitoring of designated National Scenic and Historic Trails; and data and records management requirements for National Scenic and Historic Trails.

U.S. Forest Service Scenery Management System

The Scenery Management System establishes SIOs through a land and resource management plan. SIOs describe the minimum degree to which desired scenic character attributes are to remain intact. There are four nationally defined SIOs that can serve as desired conditions and one (very low) used only in describing existing (not desired) conditions. The land where the Project would occur has been designated as having high and moderate SIOs (USFS 2024b) (Appendix Q, Figure 3.20-6). A high SIO is described in the Ashley LMP as a management activity that goes unnoticed and where the landscape appears unaltered (USFS 2024b). A moderate SIO is defined in the Ashley LMP as management activities that are noticeable but are subordinate to the scenic character and where the landscape appears slightly altered (USFS 2024b).

Flaming Gorge Scenic Byway Corridor Management Plan

The 2020 Draft Flaming Gorge Scenic Byway Corridor Management Plan Update builds on the 2011 Flaming Gorge Scenic Byway Corridor Management Plan, and it is anticipated that this document will be adopted. This management plan is intended to guide the ongoing management of the byway and the designation of the two-state Flaming Gorge All-American Road loop (Dennis et al. 2020). The Flaming Gorge-Green River Basin Scenic Byway was designated as a Wyoming State Scenic Byway by the Secretary of WYDOT in 2005. Protection of the intrinsic qualities found within the corridor of the Flaming Gorge-Green River Basin Scenic Byway is largely, but not entirely, under the purview of the federal government through either the BLM or USFS. The Scenic Byway Corridor Management Plan

relies on the aesthetic and visual regulation and objectives in the Ashley LMP and Kemmerer and Rock Springs RMPs.

National Trails System

Federal agencies must consider the effects of proposed actions on National Scenic Trails and NHTs under NEPA and the National Trails System Act of 1968 (16 USC 1246). The law states that other activities along a National Scenic Trail or NHT, which would 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 practical, efforts shall be made to avoid activities incompatible with the purposes for which such trails were established (16 USC 1246). More specifically, the Secretary of the Interior or the Secretary of Agriculture may grant easements and ROWs 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 ROWs shall be related to the policy and purposes of the National Trails System Act (16 USC 1248).

There is a two-step process for designating a trail as either a National Scenic Trail or an NHT: 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 the FLPMA.

Comprehensive Management and Use Plan

The Comprehensive Management and Use Plan Final Environmental Impact Statement for the California and Pony Express National Historic Trail and Management and Use Plan Update Final Environmental Impact Statement for the Oregon and Mormon Pioneer National Historic Trail was published in 1999. This plan provides broad-based policies, guidelines, and standards for administering the four trails to ensure protection of trail resources, their interpretation, and their continued use.

3.20.1.7 Sensitive Viewers

Sensitive viewing platforms represent specific places, areas, and features that have visual importance relative to one's home, social, business, and recreation environment. Sensitive viewing platforms represent viewing locations or key observation points (KOPs) where the public would view the analysis area and the Project from a stationary location (e.g., residential area) or a linear (e.g., major roadway) location. Sensitive viewer groups who would potentially see the Project from KOPs consist of the following:

- **Vehicular travelers:** Travelers who use roadways from which the landscape is viewed.
- **Tourists, visitors, and recreational users:** Local and seasonal residents engaged in recreational activities and tourists and recreational users visiting from outside the local area.
- **Residents:** People who live and work in the analysis area. Generally, they view the landscape from their properties and homes and often from places of employment while engaged in daily activities.

KOPs associated with travelers, residences, and recreational users were identified in coordination with BLM RSFO and KFO staff and are defined below in Table 3.20-2. Thirteen KOPs (Appendix Q, Figure 3.20-7) were used to analyze the Project for all proposed alternatives; however, not all KOPS were used to analyze every alternative due to distance from Project facilities, components, and variability of

alternatives. Distance zones listed in Table 3.20-2 describe the relative distance from Project components that are highly visible and are adapted from the BLM distance zones (foreground/middleground [between 0–5 miles], background [up to 5 miles], and seldom seen, referred to as beyond background [over 15 miles]).

Table 3.20-2. Key Observation Points in the Visual Resource Analysis Area

KOP Number	KOP Name	Sensitive Viewer Group	Approximate Distance to Mine Permit Boundary in Miles (Alternative B)
			Distance Zone
1	Flaming Gorge Scenic Byway -SB	Tourists/travelers	6.2 Background
2	Southern recreational trail	Tourists/recreational	2.9 Foreground/middleground
3	Southern recreational trail/McKinnon Road	Tourists/travelers	4.5 Foreground/middleground
4	Southern recreational trail/Hwy 530	Tourists/travelers	7.9 Background
5	Flaming Gorge Scenic Byway – NB - Pipeline	Travelers	6.9 Background
6	Little America	Tourists/travelers	12.8 Background
7	HWY 347 – Oregon and California NHTs Auto Tour Route/Trona Byway/I 80 (Transmission Line)	Tourists/travelers	12.6 Background
8	Granger Community Park	Recreational	18.1 Beyond background
9	HWY 347/I 80 – (Railroad crossing)	Travelers	13.8 Background
10	LaBarge/Texas Gulf Road	Travelers	23.4 Beyond background
11	Residential viewers	Residential	18.4 Beyond background
12	I 80 Interchange	Tourists/travelers	15.9 Beyond background
13	HWY 374	Tourists/travelers	12.9 Background

3.20.2 Environmental Consequences

3.20.2.1 Analysis Method

The following issues were identified for the analysis to assist in detailing the impacts that the Project and the alternatives would have on the existing landscape character and to sensitive viewing locations or observers (Table 3.20-3).

Table 3.20-3. Issues Identified for Analysis

Preliminary Issue	Impact Indicator	Spatial Analysis Area	Temporal Scale
How would the proposed Project impact the scenic quality within the analysis area?	Level of visibility and contrast of Project and impact to SQRUs	Project area and 5 miles around the Project area and components, and 3 miles around linear Project components	Throughout the life of the Project, from the start of Project construction, through operations, and through completion of reclamation activities
Would the proposed Project conform with the VRM classifications as described in the Green River and Kemmerer RMPs and the SIO described in the Ashley LMP?	Conformance with VRM class objectives		
How would the proposed Project impact sensitive viewing locations (KOPs), including NHTs and trails, be determined eligible for inclusion under an existing NHT?	Level of visibility and contrast of Project when viewed from KOPs Level of visibility and contrast of Project when viewed from NHTs	Project area and 5 miles around the Project area and components, and 3 miles around linear Project components	Throughout the life of the Project, from the start of Project construction, through operations, and through completion of reclamation activities

The analysis evaluated the preliminary issues identified for analysis in Table 3.20-3 and used the following five steps to assess the existing visual environment and impacts to the visual environment from the Project:

1. Define a visual analysis area and locations from where the Project may be visible.
2. Describe existing visual resources (i.e., values identified as part of VRI) within the analysis area to identify impacts to visual values resulting from the introduction of Project components (these two steps of the process are detailed in Sections 3.20.1 and 3.20.2).
3. Detail changes in visual contrast and impacts to the SQRUs and SLRUs, sensitive viewing locations (KOPs), night skies, NHTs, and Flaming Gorge Scenic Byway associated with Alternative B.
4. Complete BLM contrast rating worksheets based on field observations incorporating environmental factors with supporting photographic simulations from each KOP to assess conformance with VRM objectives and USFS SIOs.
5. Detail and analyze impacts per alternative.

The visual resources analysis area was defined as a 5-mile area surrounding Project facilities (mine well field, operations and maintenance facilities, etc.) and a 3-mile area surrounding linear Project features (water and gas pipelines, railroad, etc.). This area was chosen based on proposed Project components, the existing landscape characteristics and visibility of Project elements, and where potential visual effects from the Project may be discerned by the casual observer. The duration of effects to the landscape character, scenic quality, and sensitive viewing locations from Project components would occur over the life of the Project—from the construction phase through the decommissioning and reclamation phases.

The SQRUs and landscape character of the VRI at the Project level were used to identify impacts to SQRUs from Alternative B within the analysis area. The scenic quality impacts were described for the foreground/middleground, background, and beyond background areas of the Project in relation to the overall SQRUs. Impacts identify which SQRUs would result in a numerical rating change associated with either the cultural modification (SQRUs where Project occurs) or adjacent scenery (SQRUs adjacent to Project) as a result of the introduction of the Project. The information associated with this portion of the analysis aids in understanding how much of the inventoried scenic quality (resource) within a given area may be impacted as a result of the introduction of the Project and provides the BLM with an

understanding of the degree or amount of change in scenic quality from a landscape-level planning perspective. This analysis can be found in the Landscape Character and Scenic Quality section.

The Project level VRI SLRUs were used to disclose impacts to SLRUs (impacts to observers) within the analysis area. Impacts to sensitivity level units are disclosed though total acre units and visible acre units. Impacts are further broken down into the foreground/middleground, background, and beyond background areas of the Project, as well as levels of high, moderate, and low sensitivity. The results below present how the introduction of the Project in this area would affect the visual sensitivity of the area. This analysis is presented in the Sensitivity Level section.

Visual impacts to sensitive viewers and viewing locations were assessed though the BLM's VRM contrast rating methodology (this analysis is provided in the Viewer Sensitivity at Key Observation Points section). Visual impacts are defined as the change to the existing visual environment resulting from the introduction of modifications to the landscape. An analysis of visual dominance, scale, and contrast was used to determine to what degree the Project would attract attention and to assess the relative change in character as compared to the existing landscape. This analysis was performed using visual simulations (Appendix O) and contrast rating worksheets (Appendix P) from each KOP and assessed as described in Table 3.20-4.

Table 3.20-4 Criteria for Assessing Level of Impacts on Visual Resources

Degree of Visual Impact	Change to Landscape Character and Scenic Quality	Contrast Perceived by Viewers from Key Observation Points Considering Environmental Factors
None	Landscape is unaltered, and/or Project elements would not attract attention. Landscape character is intact with only minor, if any, human-made modifications. No change in scenic quality rating.	Project elements would not be visually evident (no contrast).
Minor	Landscape would appear slightly altered. Human-made modifications may be present but repeat the form, line, color, texture, and pattern so completely, and at such scale, that they are not evident. Project elements would introduce new form, line, color, texture, or scale elements but would be visually subordinate. There would be a negative change in the scenic quality rating of 0.5 from the existing conditions due to human-made modifications or adjacent scenery ratings.	Project elements would create weak contrast compared with other features in the landscape when viewed.
Moderate	Landscape would appear moderately altered, and Project elements would begin to dominate the visual setting. Human-made modifications would begin to dominate the landscape character being viewed. Project elements would introduce form, line, color, texture, or scale not common in the landscape and would be visually prominent in the landscape. There would be a negative change in the scenic quality rating of 1.0 from existing conditions due to human-made modifications or adjacent scenery rating.	Landscape when viewed would appear moderately altered. Project elements would be visually prominent in the landscape and would create moderate contrast compared with other features in the landscape when viewed.

Degree of Visual Impact	Change to Landscape Character and Scenic Quality	Contrast Perceived by Viewers from Key Observation Points Considering Environmental Factors
Major	Landscape would appear heavily altered. Project elements would dominate the visual setting. Human-made modifications strongly dominate the landscape character being viewed. Project elements would be out of scale or contain details that are out of character with the natural landscape as viewed in the immediate foreground and foreground. There would be a negative change in the scenic quality rating of 1.5 or more from existing conditions due to human-made modifications or adjacent scenery.	Landscape when viewed would appear heavily altered. Project elements would introduce elements and/or patterns that are uncommon or not found in the landscape and create disharmony and strong contrast when viewed.

The contrast rating analysis method measures potential Project-related changes to the landscape. This method allows for a level of objectivity and consistency in the process and reduces subjectivity associated with assessing landscape character and scenic quality impacts. Using the BLM's Visual Resource Contrast Rating system, as outlined in BLM Manual H-8431 (BLM 1986b), this level of contrast determines the degree to which the Project would affect the intrinsic visual character and, in turn, the scenic quality of the landscape and the degree of attention the Project would have on sensitive viewers. In the context of the Project, the form, line, color, and texture associated with the landform, water, vegetation, and existing structures within and adjacent to the analysis area were recorded. The degree of visual impact (Table 3.20-4) correlates to the degree of visual contrast for each landscape element (e.g., land/water, vegetation, and structures) and is evaluated as none, weak, moderate, or strong in Table 3.20-5.

Table 3.20-5. Criteria for Degree of Contrast

Degree of Visual Impact	Degree of Visual Contrast	Criteria
None	None	The element contrast is not visible or perceived.
Minor	Weak	The element contrast can be seen but does not attract attention.
Moderate	Moderate	The element contrast begins to attract attention and begins to dominate the characteristic landscape.
Major	Strong	The element contrast demands attention, cannot be overlooked, and is dominant in the landscape.

Source: BLM (1986b).

As the final step in the analysis of visual impacts, conformance with the BLM's VRM objectives was evaluated. Impacts by alternative are described in Section 3.20.2.2 through Section 3.20.2.5. A cross examination of Project alternatives is contained within the Summary of Impacts and Contrast per Alternative section.

The following assumptions were included as part of the analysis of visual resources for this Project:

- SQRUs exist for the KFO as identified in the Kemmerer RMP and are available for determination of potential impacts to scenic quality. A full KFO VRI does not exist at this time.
- Over time, viewers in the area have become accustomed to the visual change related to this type of development in the landscape as a result of large-scale surface disturbances from existing mining operations and associated components.

3.20.2.2 *Alternative A (No Action)*

Under the No Action Alternative, the BLM would not authorize the new ROW grant application to construct, operate, maintain, and decommission the Project. No new disturbance to the characteristic landscape would result, and the existing conditions and trends for this resource would continue. Therefore, there would be no impact to the identified viewer groups from selected KOPs or to the landscape character and scenic quality of the analysis area.

3.20.2.3 *Alternative B (Proposed Action)*

Construction and Work Area Maintenance

During the approximately 4-year construction period, the visual character and scenic quality of the analysis area would be impacted by vegetation clearing, the generation of fugitive dust, the presence and operation of construction equipment and crews, pipeline construction activities, Project component construction, and the stockpiling of material (i.e., vegetation, soil, rocks, etc.). Removal of vegetation would expose lighter-color soils in the cleared areas. Construction activities would introduce forms, lines, colors, textures, and motion not common in the Project area, which would create moderate to major degrees of visual change during the period of construction. Following construction activities, the generation of fugitive dust, movement of construction equipment, and other site activities related to Project area preparations would cease, and facility construction would begin. Temporary construction use areas would be used to store materials, equipment, parking, temporary office trailers, refueling stations, and concrete batch plants. To the maximum extent possible, these areas would not be graded.

Table 2.2-1 summarizes the estimated acres of surface disturbance from the Project under Alternative B for mining facilities, utility infrastructure, and transportation infrastructure. Surface disturbance would begin during the construction phase of the Project and would continue until reclamation of the land is finalized. Long-term reclamation of areas of disturbance would occur. All Project components and facilities would be removed, and the landscape would be reclaimed. Project construction is anticipated to create a temporary visual impact on up to 6,322 acres.

Operations

Project operations would affect the visual character and scenic quality of the analysis area due to the visibility of the Project's railroad tracks, overhead transmission line, processing facilities, mine well field, storage ponds, and access roads. The primary cause of visual impacts associated with the Project would result from the long-term presence of the Project and the degree of contrast between the Project components and facilities within the existing characteristic landscape.

Landscape Character and Scenic Quality

The Project VRI data for scenic quality ratings were used to inform impacts to SQRUs (impacts to the resource) within the analysis area (Appendix Q, Figure 3.20-1). Impacts to scenic quality are described for the foreground/middleground, background, and beyond background areas of the Project in relation to the overall SQRUs—not from specific viewing locations (KOPs)—where the Project may be influenced by vegetation, topography, or other environmental conditions.

Impacts were calculated based on the amount of Project components within the SQRUs that would impact scenic quality. This analysis identified which SQRUs would result in a numerical change associated with either the cultural modification (SQRUs where the Project occurs) or adjacent scenery (SQRUs adjacent and in proximity to the Project) as a result of the introduction of the Project. The information associated with this portion of the analysis aids in understanding how much of the inventoried scenic quality

(resource) within a given area may be impacted as a result of the introduction of the Project and provides an understanding of the degree of amount of change in scenic quality from a landscape-level planning perspective. Changes to the scenic quality ratings from Alternative B were based on introduction of Project components (gas and water pipelines, railroad tracks, overhead transmission lines, processing facilities, mine well field, and access roads).

Foreground/middleground: Twelve SQRUs (approximately 339,283 acres) within the foreground/middleground area of the Project would experience changes to scenic quality ranging from none to major (Table 3.20-6). The Chicken Draw SQRU would be the most impacted SQRU as the mining boundary, Project facilities, and all linear components would occur within this SQRU. Six SQRUs would experience a minor degree of visual change, primarily due to the presence of linear facilities (transmission line, water and gas pipeline, railway, mine well field, or access road) passing through the SQRUs. Five SQRUs would experience no degree of visual change, as Project components would not occur within the SQRUs.

Table 3.20-6. Scenic Quality Impacts by Scenic Quality Rating Unit within the Foreground/ Middleground

SQRU Number	SQRU Name	Total SQRU (acres)	Existing Scenic Quality Rating	Post-Project Scenic Quality Rating within Foreground/ Middleground	Scenic Quality Change Rationale	Degree of Visual Change*
001	Chicken Draw	132,401.6	C (11.0)	C (9.5)	The majority of Project components and impacts would occur within this area. Water line, mine permit boundary and facilities, and linear components would be present. Existing facilities would occur in adjacent SQRUs.	Major
002	Antelope Knoll	11,587.9	C (8.5)	C (8.5)	No Project components; adjacent SQRU to Chicken Draw SQRU.	None
003	Little America	48,480	C (4.0)	C (3.5)	Transmission line would cut through the middle of this SQRU. Existing transmission lines, roads, and mining facilities would be present.	Minor
004	Black Forks River	2,641.8	B (16.0)	B (16.0)	Adjacent to affected SQRUs, topography, and vegetation; distance from Project components would not result in any change in scenic quality.	None
005	Granger	18,061	C (11.0)	C (10.5)	Rail line follows existing roadway for half this SQRU. Significant disturbance and development in this area. Railroad would hook into existing railway.	Minor
024	White Mountain	9,638.4	B (14.0)	B (13.5)	Water pipeline would cut through the southern portion of the SQRU. Water line would run parallel to existing roadway and would be reclaimed.	Minor
029	Green River	8,550.9	A (20.0)	A (19.5)	Water pipeline would be located approximately 0.3 miles from residential development. Water pumphouse would be located adjacent to the Green River.	Minor

SQRU Number	SQRU Name	Total SQRU (acres)	Existing Scenic Quality Rating	Post-Project Scenic Quality Rating within Foreground/ Middleground	Scenic Quality Change Rationale	Degree of Visual Change*
030	Green River Plains	86,061.5	C (5.5)	C (5.0)	Water pipeline would run through the southern portion of the SQRU adjacent to the existing roadway.	Minor
031	Firehole Canyon	3,623.4	B (17.0)	B (17.0)	Adjacent to affected SQRU.	None
039	Sage Steppe	10,452.2	C (9.0)	C (9.0)	Adjacent to affected SQRU.	None
040	Cedar Mountain Badlands	416.6	C (5.5)	C (5.5)	SQRU is more than 4 miles from Project components. Not an adjacent SQRU.	None
052	Twin Buttes Base	7,401.6	C (7.0)	C (6.5)	Water pipeline would run through the northernmost portion of the SQRU adjacent to the existing roadway.	Minor
Total		339,283				

Note: Based on GIS analysis as described in Section 3.20.2.1.

* See Table 3.20-4 for the degree of visual change determinations.

Background: Three SQRUs (approximately 192,469 acres) within the background area of the Project would experience a change to scenic quality ranging from none to major (Table 3.20-7). The Chicken Draw SQRU would experience the most impacts, because the mining boundary, Project facilities, and all linear components occur within this SQRU. One SQRU would experience a minor degree of visual change, primarily because of linear facilities that would pass through the SQRU. One SQRU would experience no degree of visual change, as Project components would not occur within the SQRU.

Table 3.20-7. Scenic Quality Impacts by Scenic Quality Rating Unit within the Background

SQRU Number	SQRU Name	Total SQRU (acres)	Existing Scenic Quality Rating	Post-Project Scenic Quality Rating within the Background	Scenic Quality Change Rationale	Degree of Visual Change*
001	Chicken Draw	132,401.6	C (11.0)	C (9.5)	Majority of Project components and impacts would occur within this area. Water line, mine permit boundary and facilities, and linear components would be present. Existing facilities would occur in adjacent SQRUs.	Major
002	Antelope Knoll	11,587.9	C (8.5)	C (8.5)	No Project components in the SQRU; adjacent to Chicken Draw SQRU.	None
003	Little America	48,480	C (4.0)	C (3.5)	Transmission line would cut through the middle of this SQRU. Existing transmission lines, roads, and mining facilities would be present.	Minor
Total		192,469.5				

Note: Based on GIS analysis as described in Section 3.20.2.1.

* See Table 3.20-4 for the degree of visual change determinations.

Beyond background: Four SQRUs (approximately 201,496 acres) within the beyond background area of the Project would experience changes to scenic quality ranging from none to major (Table 3.20-8). The Chicken Draw SQRU would be the most impacted SQRU, because the mining boundary, Project

facilities, and all linear components occur within this SQRU. Two SQRUs would experience a minor degree of visual change, primarily due to the presence of linear facilities passing through the SQRUs. One SQRU would experience no degree of visual change, as Project components would not occur within the SQRU.

Table 3.20-8. Scenic Quality Impacts by Scenic Quality Rating Unit in the Beyond Background

SQRU Number	SQRU Name	Total SQRU (acres)	Existing Scenic Quality Rating	Post-Project Scenic Quality Rating within Immediate Foreground	Scenic Quality Change Rationale	Degree of Visual Change*
001	Chicken Draw	132,401.6	C (11.0)	C (9.5)	Majority of Project components and impacts would occur within this area. Water line, mine permit boundary and facilities, and linear components would be present. Existing facilities occur in adjacent SQRUs.	Major
002	Antelope Knoll	11,587.9	C (8.5)	C (8.5)	No Project components in this SQRU; adjacent to Chicken Draw SQRU.	None
003	Little America	48,480	C (4.0)	C (3.5)	Transmission line would cut through the middle of this SQRU. Existing transmission lines, roads, and mining facilities are present.	Minor
005	Granger	18,061	C (11.0)	C (10.5)	Rail line would follow existing roadway for half this SQRU. Significant disturbance and development would occur in this area. Railroad would hook into existing railway.	Minor
Total		201,496.7				

Note: Based on GIS analysis as described in Section 3.20.2.1.

* See Table 3.20-4 for the degree of visual change determinations.

Sensitivity Level

Changes to the SLRUs from Alternative B were based on the introduction of Project components (water and gas pipelines, railroad tracks, overhead transmission line, processing facilities, mine well field, and access roads). The results presented below show how the Project would affect the visual sensitivity of the area.

Table 3.20-9 details the SLRUs within the visual analysis area (rated from low to high), total acres of SLRU within the analysis area, visible acres within the SLRU, and percentage of visible acres compared to total acres. One unit within the analysis area was not inventoried (unit 076), two units were rated as low sensitivity (units 003 and 004), five units were rated as moderate sensitivity, and nine units were rated as high sensitivity. The Project would introduce visible landscape changes from KOPs to approximately 25,825.8 acres (19%) of the total acres of low sensitivity units in the visual analysis area. The Project would introduce visible landscape changes from KOPs to approximately 4,631.3 acres (14%) of the total acres of moderate sensitivity units in the visual analysis area. The Project would also introduce visible landscape changes from KOPs to approximately 37,391.9 acres (21%) of the total acres of high sensitivity units in the visual analysis area.

Table 3.20-9. Sensitivity Level Ratings within the Visual Analysis Area

SLRU Number	Sensitivity Level Rating	Total SLRU (acres)	Acres of SLRUs Visible from KOPs	Sensitivity Level Rating Change at KOPs (percentage of visible acres/existing acres)
001	High	57,537.6	14,001.2	24.3%
002	Moderate	21,210.5	3,056.8	14.4%
003	Low	107,949.2	23,152.1	21.4%
004	Low	26,441.2	2,673.7	10.1%
026	Moderate	2,590.4	540.9	20.8%
042	High	9,782.2	1,548.8	15.8%
043	High	165.1	0.4	0.2%
045	Moderate	4,183.1	279.2	6.6%
046	High	7,660.5	1,267.3	16.5%
047	High	34,158.9	8,251.7	24.1%
051	High	25,215.8	7,332	29%
053	High	5,061.8	42	0.8%
054	High	29,166.1	3,696.6	12.6%
058	Moderate	4,100.2	732.8	17.8%
061	High	4,880.2	1,251.9	25.6%
069	Moderate	166.9	21.6	12.9%
076	Not inventoried	9,649.8	1,026.4	10.6%
Total		349,919.5	68,875.4	19.6%

Note: Based on GIS analysis as described in Section 3.20.2.1.

This analysis also examined the percentage of acres that have potential visibility of the Project by distance zone (Table 3.20-10). Most disturbance occurs within the foreground/middleground distance zone, which is where most observers would be located along roadways (I 80, WY 374, WY 530, McKinnon Road, and the Little America Hotel).

Table 3.20-10. Sensitivity Level Ratings within the Visual Analysis Area

Distance Zone	Total Area in Distance Zone (acres)	Total Visible Areas from KOPs in Distance Zone (acres)	Percentage of Visible Areas from KOPs
Foreground/middleground	339,283.0	59,555.1	17.50%
Background	192,469.5	8,167.2	4.20%
Beyond background	261,496.7	86.6	0.03%
Total	793,249.2	67,808.9	8.50%

Note: Based on GIS analysis as described in Section 3.20.2.1.

Viewer Sensitivity at Key Observation Points

Changes to viewer experiences at each KOP from Alternative B were based on the introduction of Project components (water and gas pipelines, railroad tracks, overhead transmission line, processing facilities,

mine well field, and access roads). The results presented below show how the Project would affect KOPs in the area.

Vehicular Travelers

Contrast to vehicle travelers and routes from the introduction of Project components within the landscape would range from moderate to none under Alternative B. Table 3.20-11 identifies the level of impacts associated with KOPs 1, 3, 4, 5, 6, 7, 9, 10, 12, and 13.

Observers at KOPs 1, 5, and 7 would experience a weak degree of visual contrast with views of various Project components, including the Project facilities, storage ponds, mine well fields, disturbed ground associated with the buried water pipeline, transmission line, railroad line, and access roads. The Flaming Gorge Scenic Byway (represented by KOPs 1 and 5) would experience weak contrast and low impacts to observers. Views of the Project components (transmission line, buried pipeline, and ground disturbance) near the affected KOPs would consist of views containing other transmission lines within the viewshed. These components would be seen but would not attract attention. The landscape would appear slightly altered, and human modifications would be present but would repeat the form, line, color, and texture of elements in the existing landscape. Observers at KOPs 3, 4, 6, 10, 11, 12, and 13 would experience no contrast or visual impacts to observers due to the distance between Project components and KOP locations and the obstruction of views due to existing development, topography, and vegetation. The greatest degree of impact to travelers under this alternative would be at KOP 9, which includes the proposed overpass that would cross over I 80. This Project component would attract attention but would not dominate the landscape.

Table 3.20-11. Degree of Visual Change for Travelers

KOP Number	KOP Name	Approximate Distance to Mine Permit Boundary in Miles Distance Zone	Degree of Visual Contrast/Impact
1	Flaming Gorge Scenic Byway – SB	6.2 Background	Weak/low
3	Southern recreational trail/McKinnon Road	4.5 Foreground/middleground	None/none
4	Southern recreational trail/Hwy 530	7.9 Background	None/none
5	Flaming Gorge Scenic Byway – NB – Pipeline	6.9 Background	Weak/low
6	Little America	12.8 Background	None/none
7	HWY 347 – Oregon and California NHTs Auto Tour Route/Trona Byway/I 80 (transmission line)	12.6 Background	Weak/low
9	HWY 347/I 80 (railroad crossing)	13.8 Background	Moderate/moderate
10	LaBarge/Texas Gulf Road	23.4 Beyond background	None/none
12	I 80 Interchange	15.9 Beyond background	None/none
13	HWY 372	12.9 Background	None/none

Tourists, Visitors, and Recreational Users

Impacts to tourists, visitors, and recreational users from the introduction of Project components within the landscape would range from low to none under the Proposed Action. Table 3.20-12 identifies the degree of impacts associated with observers at tourist, visitor, and recreational KOPs. KOPs 1, 5, 7, and 8 would experience a weak degree of contrast and low degree of impact to viewers in these areas. Views would consist of various Project elements, including ground disturbance associated with the buried water pipeline, transmission line, rail line, and access roads. The Flaming Gorge Scenic Byway (represented by KOPs 1 and 5) would experience weak contrast and low impacts to observers. Views of the transmission line near the affected KOPs would consist of views containing other transmission lines within the viewshed. These components would be seen but would not attract attention. The landscape would appear slightly altered, and human modifications would be present but would repeat the form, line, color, and texture of elements in the existing landscape. Observers at KOPs 2, 3, 4, and 6 would experience no contrast or visual impacts to observers due to the distance between Project components and KOP locations and the obstruction of views due to existing development, topography, and vegetation. Observers on the southern recreational trail (as represented by KOPs 2, 3, and 4) would experience no degree of visual impacts.

Table 3.20-12. Degree of Visual Change for Tourists, Visitors, and Recreational Users

KOP Number	Name	Approximate Distance to Project Boundary Distance Zone	Degree of Visual Contrast/Impact
1	Flaming Gorge Scenic Byway -SB	6.2 Foreground/middleground	Weak/low
2	Southern recreational trail	2.9 Foreground/middleground	None/none
3	Southern recreational trail/McKinnon Road	4.5 Foreground/middleground	None/none
4	Southern recreational trail/Hwy 530	7.9 Background	None/none
5	Flaming Gorge Scenic Byway – NB - Pipeline	6.9 Background	Weak/low
6	Little America	12.8 Background	None/none
7	HWY 347 – Oregon and California NHTs Auto Tour Route/Trona Byway/I 80 (transmission line)	12.6 Background	Weak/low
8	Granger Community Park	18.1 Beyond background	Weak/low

Impacts to National Historic Trails

BLM Manual 6280 (BLM 2012b) states that the NEPA analysis for a Proposed Action must 1) be able to identify reasonable alternative project locations with potentially less or no adverse impact; 2) document the resources, qualities, values, associated settings, and primary uses that support the nature and purposes for which the trail was designated; and 3) assess potential impacts on the landscape elements of potentially affected, designated NHTs (e.g., California, Pony Express, Oregon, and Mormon Pioneer Trails).

Per BLM Manual 6280, the inventory and analysis are limited to the potentially affected segment of the trails that are within the analysis area. There are no high potential sites or high potential segments for the

four NHTs that occur within the analysis area. The following analysis identifies any potential visual impacts to the trails and whether these impacts would interfere with the trails' nature and purposes.

All four NHTs occur in the northern end of the visual analysis area, approximately 17 miles from the Project area and the rail line (the nearest Project component); under Alternative B the rail line would overlap the California NHT and run parallel to an existing roadway (US 30). The NHTs in this area are represented by KOP 8 in Granger. Impacts and details pertaining to NHTs are detailed in Table 3.20-13. Figure 3.20-7 (Appendix Q) shows the congressionally designated alignment of the NHTs and the Oregon and California NHTs Auto Tour Route.

Table 3.20-13. Degree of Visual Change for Tourists, Visitors, and Recreational Users on National Historic Trails

Trail Name	Year Designated as a NHT by Congress	Management Plan	Representative Trail KOPs	Distance from Representative KOPs to Project Boundary (miles)	Degree of Visual Contrast/Impact
Oregon	1978	<i>Management and Use Plan Update Final Environment Impact Statement Oregon National Historic Trail</i>	KOP 8	13.9	Moderate/moderate
California	1992	<i>Comprehensive Management and Use Plan Final Environmental Impact Statement California National Historic Trail</i>	KOP 8	13.8	Moderate/moderate
Oregon/ California NHTs Auto Tour Route	Not applicable	<i>Comprehensive Management and Use Plan Final Environmental Impact Statement California National Historic Trail</i>	KOPs 7 and 13	12.6–12.9	Weak/low to none/none
Pony Express	1992	<i>Comprehensive Management and Use Plan Final Environmental Impact Statement Pony Express National Historic Trail</i>	KOP 8	13.9	Moderate/moderate
Mormon Pioneer	1978	<i>Management and Use Plan Update Final Environment Impact Statement Mormon Pioneer National Historic Trail</i>	KOP 8	13.8	Weak/low

Although these NHTs are present in the area, the degree of disturbance and development by humans is significant and apparent. The Town of Granger, multiple rail lines, US 30, and existing mineral extraction and refining facilities are some of the prominent developments within this area. Although construction of the Project would increase the level of disturbance in this area, the disturbance to NHTs in the northern part of the analysis area during construction and during the life of the Project would be minimal, if not negligible, compared to existing disturbance.

Residents

There would be no impact to residents (as represented by KOP 11) from the introduction of Project components within the landscape under the Proposed Action due to the exiting topography, vegetation, and distance from the Project. Table 3.20-14 identifies the level of impact associated with observers in the residential area.

Table 3.20-14. Degree of Visual Change for Residents

KOP Number	Name	Approximate Distance to Project Boundary Distance Zone	Degree of Visual Change Contrast/Impact
11	Residential viewers	9.4 miles Foreground	None/none

Night Skies

Dark night skies contribute to the primitive experience that many people seek when they visit undeveloped areas. Light pollution diminishes the aesthetic and values of the night sky by making it difficult to see fainter stars or other faint celestial objects (BLM 2024b). Optimal night skies are free of scattered light or skyglow, which is generated by anthropogenic light from development, transportation, or industrial operations. The scattering of artificial light in the atmosphere increases night sky luminance and erodes the visual appearance of stars and planets. Figure 3.20-8 (Appendix Q) depicts the ratio of artificial sky brightness to natural sky brightness for the lease parcels and was modeled according to *The New World Atlas of Artificial Night Sky Brightness* (Falchi et al. 2016).

Impacts to night skies from development of the Project would consist of lighting at Project facilities, warning lights, adequate lighting for loading locations, and activities (Barr Engineering 2022). Pacific Soda has committed to keep lighting to the minimum required for safety, to use motion sensors or other technologies to turn off lights in unoccupied areas, and to keep area lighting to a minimum of 10-foot candles (Barr Engineering 2022). The introduction of the Project within this area would increase the amount of lighting in the landscape. Existing night sky conditions within the area range from black (> 0.176) to dark yellow (> 0.285 and 0.397). Areas that have lost access to the natural night sky due to light pollution from existing development are shown as dark yellow (Green River, James Town, and existing mining facilities). Areas that have degraded night skies near the zenith due to light pollution are shown as green. Areas that have degraded night skies near the horizon are shown as blue. The majority of the analysis area is shown as pristine skies (shown as black) and indicate sky brightness under levels of natural light (1.7 millicandelas per square meter). The pristine sky areas would be negatively affected by the development of the Project; however, current existing mining operations and facilities show a negligible degree of night sky disturbance and light pollution.

Impacts related to light pollution of night skies should be mitigated and minimized through development of a lighting plan, which would include planning principles and BMPs, as detailed in *Night Sky and Dark Environments: Best Management Practices for Artificial Light at Night on BLM-Managed Lands* (BLM 2023a). The following six principles frame the selection and presentation of artificial light at night:

1. Light only if needed: Use alternatives to permanent lighting.
2. Light only when needed: Use lighting control technologies.
3. Light only where needed: Shield lights and direct them properly.
4. Light color matters: Select amber, orange, or red whenever possible.
5. Use the minimum level of illumination necessary: Avoid over-illumination.
6. Use energy-efficient lights and advanced lighting controls: Save energy while adding useful lighting capabilities.

Specific BMPs suggested by the BLM include, but are not limited to, having a lighting plan prepared by a qualified lighting designer; selecting luminaires certified to minimize light pollution; identifying light-sensitive receptors; conducting a baseline study of existing light pollution and night sky conditions; and

establishing a lighting and light pollution monitoring program. The application of BMPs and design features would mitigate, limit, and prevent impacts on night skies.

Decommissioning

The effects of decommissioning the Project would be similar to the effects of construction, in that there would be a temporary introduction of construction equipment and ground disturbance. However, degrees of visual change from decommissioning would differ from construction in that lands previously disturbed throughout the Project would likely become less visible over time because of reclamation activities and revegetation. Final facility decommissioning and reclamation of mining-related surface disturbances and liner infrastructure would be conducted and would return any surface disturbances to conditions compatible with their pre-mining uses and state.

3.20.2.4 *Alternative C*

Alternative C would retain all Project components described in the Mine Plan for Alternative B except for the overhead transmission line, which would be constructed along I 80 and extend south to be collocated with the rail line. Additionally, the access road would use an existing interchange on I 80 (at Exit 61) and run along I 80 before turning south to be collocated with the rail line. This change would collocate the transmission line, access road, and rail line and thereby reduce construction through undisturbed areas. This change would also eliminate the need to construct road improvements (widening and intersection) at the intersection of US 30 and the new access road. Long-term disturbance during the operations phase of the Project would be similar to Alternative B with the introduction of additional miles of linear components as compared to Alternative B. This includes an additional 2.4 miles for the northern access road (increase from 16.1 to 18.5 miles) and an additional 6.1 miles of transmission line infrastructure (increase from 17 to 23.1 miles). Impacts related to Alternative C at KOPs and night skies would be similar to Alternative B.

3.20.2.5 *Alternative D (Preferred Alternative)*

Alternative D reflects substantial changes to facility placement. Although development of the mine well field and mine production levels would remain the same as Alternative B, other Project facilities, which were within the mine permit boundary for Alternatives B and C, would be moved to an area north of I 80. The access road would run southeast toward the Project area, running parallel to the proposed transmission line. The degree of disturbance within the mine permit boundary would be less than Alternatives B and C with the relocation of Project facilities; however, the relocation of Project facilities would increase the overall visual disturbance and footprint of the Project. Additionally, the relocated Project facilities would cause increased impact to vehicular travelers on I 80 and tourists on the Auto Tour Route from I 80, WY 372, and WY 374 due to the proximity of viewers to the Project refinery. Travelers would see Project facilities (geometrical shapes, large industrial infrastructure, steam/vapor cloud, etc.) in greater detail compared to Alternatives B or C. These facilities would not be overlooked by travelers and would become a dominating feature and create a strong visual contrast with the existing landscape, especially to eastbound travelers on I 80 and WY 374 who would have an extended duration of views in front of them because of the elevated placement of Project facilities. Alternative D would introduce a large-scale industrialized cultural modification adjacent to roadways, which would change the primarily naturalized landscape into a more industrialized landscape. Long-term disturbance during the operations phase of the Project would be similar to Alternative B at the mining site but would introduce additional miles of linear components. This would include an additional 13.4 miles of access road, including existing access roads (an increase from 16.1 to 29.5 miles), and an additional 12.5 miles of transmission line infrastructure (an increase from 17 to 29.5 miles). Impacts from Alternative D at KOPs and night skies would differ from Alternatives B and C due to the greater impacts to viewers on I 80 and

WY 374 with the proposed location of the refinery and components just north of those roadways. Project facilities would also result in an increase of piping used between the mine permit boundary and Project facilities north of I 80. Under Alternative D, lighting associated with Project facilities would not be consolidated to one area, as under Alternatives B and C, but would be spread out over two areas—the mine site (same as Alternative B and C) and just north of I 80 for refinery facilities—and overall lighting density would be decreased.

3.20.2.6 *Summary of Impacts and Contrast per Alternative*

The degree of disturbance from the Project would vary between Alternatives B, C, and D. Table 2.4-1 summarizes only the proposed surface disturbances for the Project components that vary by alternative. All other major components of the mine operations would be the same as described under Alternative B. Alternative B (Proposed Action) would cause a total disturbance of 6,325 acres, Alternative C would cause a total disturbance of 6,387 acres, and Alternative D would cause a total disturbance of 7,015 acres. Where visual disturbance is inevitable, feasible BMPs should be employed to minimize disturbance as detailed in Appendix D.

Methodology provided in BLM Manual H-8431-1 (BLM 1986b) was used to evaluate the visual contrast created by the alternatives on the existing landscape as seen from the identified KOPs. The degree to which a management activity affects the visual quality of a landscape largely depends on the visual contrast created between a project and the existing landscape. Completed BLM contrast rating worksheets for each KOP within the analysis area, for each alternative, are provided in Appendix P. To minimize disturbance at visually sensitive locations, including the NHTs and Flaming Gorge Scenic Byway, special care should be taken during the revegetation process to ensure that grasses and shrubs used after ground disturbance are similar to those in the existing landscape to minimize the degree of visual disturbance.

Table 3.20-15 identifies each KOP, the degree of contrast and impact by alternative, the associated VRM class, and Project conformance with the associated VRM class.

Table 3.20-15. Degree of Visual Change – Alternative Comparison

KOP Number	KOP Name	Alternative B Contrast/Impact	Alternative B VRM Class Conformance with VRM Class	Alternative C Contrast / Impact	Alternative C VRM Class Conformance with VRM Class	Alternative D Contrast/Impact	Alternative D VRM Class Conformance with VRM Class
1	Flaming Gorge Scenic Byway - SB	Weak/low	Class IV Yes	Weak/low	Class IV Yes	Weak/low	Class IV Yes
2	Southern recreational trail	None/none	Class IV Yes	None/none	Class IV Yes	None/none	Class IV Yes
3	Southern recreational trail/McKinnon Road	None/none	Class IV Yes	None/none	Class IV Yes	None/none	Class IV Yes
4	Southern recreational trail/Hwy 530	None/none	Class IV Yes	None/none	Class IV Yes	None/none	Class IV Yes
5	Flaming Gorge Scenic Byway - NB	Weak/low	Class IV Yes	Weak/low	Class IV Yes	Weak/low	Class IV Yes
6	Little America	None/none	Class IV Yes	None/none	Class IV Yes	None/none	Class IV Yes
7	HWY 347 – Oregon and California NHTs Auto Tour Route/Trona Byway/ I 80 (transmission line)	Weak/low	Class IV Yes	Weak/low	Class IV Yes	Weak/low	Class IV Yes
8	Granger Community Park	Weak/low	Class IV Yes	Weak/low	Class IV Yes	None/none	Class IV Yes
9	HWY 347/I 80 – (Railroad crossing)	Moderate/moderate	Class IV Yes	Moderate/moderate	Class IV Yes	None/none	Class IV Yes
10	Highway 347 at Lozier Road	None/none	Class IV Yes	None/none	Class IV Yes	None/none	Class IV Yes
11	Residential Viewers	None/none	Class IV Yes	None/none	Class IV Yes	None/none	Class IV Yes
12	I 80 Interchange	None/none	Class IV Yes	None/none	Class IV Yes	Strong/high	Class IV Yes
13	HWY 372	None/none	Class IV Yes	None/none	Class IV Yes	Moderate/moderate	Class IV Yes

The visual impacts from the Project would be similar to the operation of existing industrial and mining developments that occur within the surrounding visual landscape. Under Alternatives B, C, and D, the Project is anticipated to conform with the VRM class objectives as defined in the Kemmerer and Rock Springs RMPs. It is anticipated that using BMPs (Appendix D) to decrease initial visual disturbance and decrease the amount of visual disturbance after construction and during operations would result in lower visual contrast and impacts to viewers under all alternatives.

3.20.2.7 *Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity*

Under all action alternatives, there would be irretrievable effects on the landscape character and scenic quality throughout the life of the Project (up to 34 years) with the development of the Project on previously undisturbed lands. These irretrievable impacts would be lessened by the revegetation and soil stabilization activities associated with mine closure and reclamation. However, the visual landscape in and surrounding the Project area would continue to show evidence of the existing and future landform and vegetation modifications. This would continue indefinitely during the life of the mine and post-closure. These impacts would be irreversible because of the scale and geographic area of disturbance and because these areas would not be taken back to pre-disturbance contours. These irreversible impacts would occur under all alternatives, except under the No Action Alternative. It should be noted that viewers within the existing landscape are accustomed to the landform modifications and visual disturbances similar to those that are proposed and are currently existing within the landscape.

3.20.2.8 *Cumulative Impacts*

Of the RFFAs identified in Appendix E, Project West and the American Soda Solution Mining Expansion are expected to have similar visual impacts as the proposed Project and alternatives. When combined with the Project, these RFFAs would continue to increase the presence and prominence of trona mine infrastructure and operations within the visual landscape.

The West Soda mining Project, due to its proximity to the community of Granger, US 30, and I 80, would be a prominent change to the foreground/middleground areas and visual impacts would affect a greater number of viewers as compared to the American Soda Solution Mining Expansion. The American Soda Solution Mining Expansion, which is in a more remote location, would require more infrastructure development in the form of access roads and operations infrastructure (e.g., overhead transmission lines and railroad tracks) to access the more remote area. Project operations for both RFFAs would affect the visual character and scenic quality due to the visibility and/or presence of Project infrastructure, such as railroad tracks, overhead transmission lines, processing facilities, mine well fields, storage ponds, and access roads where this infrastructure currently does not exist. The primary cause of visual impacts associated with these projects in combination with the proposed Project and alternatives would result from the long-term presence of industrial infrastructure and the degree of contrast between the Project components and facilities within the existing characteristic landscape.

3.21 Fire and Fuels

This section describes the wildland fire environment and fire and fuels management in the Project analysis area. Moreover, this section also provides baseline and impact information for wildland fire, and analyzes the impacts from the construction, operations, and decommissioning of the mine. To provide context for how this resource was analyzed, the first portion of this section identifies the issues to be analyzed and the wildland fire environment analysis area, and establishes the pertinent wildfire policies

and regulations. The subsequent Affected Environment section describes the methods used to describe the wildland fire environment and current conditions.

The Environmental Consequences section outlines the methods used to assess impacts on the wildland fire environment, describes the impacts resulting from the Proposed Action and its alternatives, and identifies appropriate mitigation measures to minimize potential adverse impacts.

Project scoping identified the following fire and fuels management issues for detailed analysis:

- How would an increase in potential ignition sources (construction, operations, and decommissioning/reclamation activities) impact recent fire patterns within a 25-mile buffer from the mean center of the Project footprint (includes Proposed Action and all alternatives)?
- How would ground disturbance change fuel characteristics (fuel type, fuel loading, fuel continuity, fuel arrangement, and invasive species) and cause fire behavior to be more moderate or extreme within the Project footprint?
- How would increased infrastructure on the landscape negatively or positively impact incident response and suppression tactics within the Project footprint?

The analysis area for fire behavior (fuels characteristics) and fire response is within the combined area of the Project footprints of the Proposed Action and alternatives, totaling 8,769 acres. The combined area of the Project footprints was determined as the fire behavior and responses analysis area because the fuels, which play a major role in determining fire behavior, would be disturbed only within this area; fuels outside the disturbance boundary would not be disturbed.

The analysis area for fire history (ignition impacts) is a 25-mile buffer from the mean center of the combined Project footprints of the Proposed Action and alternatives, creating a 25-mile-wide area around the mean center of the Project footprint totaling approximately 1,256,642 acres. (Note: the fire history analysis area is shown in all figures to give context for the fire behavior analysis area). The 25-mile buffer from the mean center of the combined Project footprint was chosen as the analysis area for fire history due to 1) the distribution and size of fires; 2) fuel loading and distribution; 3) to capture the transportation corridors; 4) to provide context on common ignition sources and their distribution in the immediate region; and 5) the modeled fire behavior (e.g., rates of fire spread) in the area and surrounding region.

The Monitoring Trends in Burn Severity (USGS et al. n.d.) and National Interagency Fire Center (2022, 2023) datasets were used to compile fire history data across the analysis area. Vegetation and fuels data were compiled from LANDFIRE 2.2.0. State and local government data regarding fire response and management were compiled from various state and federal sources. Fuels management data on federal land were compiled from the BLM's National NEPA Register for the High Desert District.

National interagency wildland fire policy, including the 2009 Guidance for Implementation of Federal Wildland Fire Management Policy and the National Cohesive Wildland Fire Management Strategy, provides high-level interagency standards for federal land management agencies in wildfire activities. BLM RMPs provide overarching guidance and evaluation of resources and resource use management on public land, including fire and fuels management. Fire management activities on BLM-administered lands in the KFO and RSFO that encompass the Project area are further directed by the *Fire Management Plan Southwestern Zone Wyoming BLM* (BLM 2004c). The overall goals of wildfire management under this plan include firefighter and public safety, protection of values, natural and cultural resources, public health, and allowing fire to function in its ecological role where appropriate. The 2015 ARMPA further guides land and resource management on BLM-administered lands in GRSG HMAs (BLM 2015), some of which are located to the immediate east of the Project area. The BLM Wyoming Fire and Aviation Program is responsible for fire suppression, treatment of hazardous fuels, fire prevention and

investigation, and fire rehabilitation on 17.5 million acres of public land in Wyoming (BLM n.d.). Additionally, the Wyoming BLM Southwestern Zone Fire Program operates under five annual operating plans that allow local, state, and federal agencies to work cooperatively on wildland fire incidents and prescribed fire projects (BLM 2004c).

3.21.3 Affected Environment

The fire history analysis area (the larger fire environment area) and its surrounding region is shaped by a complex interplay of historical and present environmental dynamics along with human activities. These influential factors give rise to variations in fuel availability, weather patterns, and potential ignition sources, thereby influencing the overall fire risk. Examining the current state of the fire environment reveals a range of trends, management practices, and land use factors that contribute to its present condition. These include the following:

- Climate change trends of predicted increased drought and warming
- Past and current fuels and vegetation management
- Fire suppression activities from past and future wildfires
- Emergency stabilization and burned area rehabilitation
- Livestock grazing and other agricultural activities
- General population growth, especially in wildland urban interface areas
- Increased electrical infrastructure
- Construction/maintenance of existing and proposed linear features (e.g., other transmission lines, roads, rail lines, and highways)
- Increase in recreational use

The combined influence of these trends and actions has significantly transformed the fire environment, resulting in heightened possibilities for new ignitions and subsequent fire outbreaks. Moreover, these activities have played a role in the proliferation of nonnative species, further disrupting the historical fire regime, while also altering the landscape in ways that impact the effectiveness of fire suppression resources. This is evident through the expansion of infrastructure, including road networks, electrical transmission lines and poles, and additional overhead structures. Notably, sagebrush ecosystems have experienced substantial impacts, prompting adjustments to management plans and the implementation of specific actions (Chambers et al. 2014).

3.21.3.1 Fire History

From 1992 to June 2023, 222 fires occurred in the fire history analysis area (Table 3.21-1; Appendix Q, Figure 3.21-1). Of these fires, 98 were human caused (44.1%), 45 were natural ignitions (20.3%), and 79 had an unknown or undetermined cause (35.6%) (National Interagency Fire Center 2022, 2023; USGS et al. n.d.). Although the majority of fires in the analysis area were relatively small (86.9% were less than 10 acres), the number of fires per decade has increased since the turn of the twenty-first century (Wyoming State Forestry Division 2020). In fact, the period from January 2022 to June 2023 has experienced 31 fires, which is more than three times the number of fires during the period from 1992 to 2011 (Table 3.21-1).

The frequency of lightning ignitions varies spatially and is influenced by climate and weather patterns, topography, and fuel characteristics. Human-caused ignitions in sagebrush communities are generally

associated with increased human activity along roads, residential areas, or areas frequented for recreation (Innes 2019). Although human-caused ignitions in sagebrush communities often stem from increased human presence near roads, residential areas, or recreational sites (Innes 2019), it is worth noting that the majority of wildfires in Wyoming originate naturally from lightning strikes (Wyoming Office of Homeland Security 2016). However, the growing population in Wyoming has led to a gradual rise in the number of human-caused fires (Wyoming Office of Homeland Security 2016).

Wyoming's semi-arid climate and vegetation types render the state particularly susceptible to wildland fires (Wyoming Office of Homeland Security 2016). Furthermore, certain ecosystems are experiencing deviations from their normal fire regimes or historical fire return intervals (Wyoming State Forestry Division 2020). Consequently, some ecosystems are now witnessing more intense burning compared to the past.

Table 3.21-1. Number of Fires by Fire Size Class and Decade in the Fire History Analysis Area

Fire Class Size	Years				Total
	1992–2001	2002–2011	2012–2021	2022–June 2023	
Size Class A (≤ 0.25 acres)	0	0	66	22	88
Size Class B (0.26–9.9 acres)	0	2	94	9	105
Size Class C (10.0–99.9 acres)	0	4	7	0	11
Size Class D (100–299 acres)	0	0	2	0	2
Size Class E (300–999 acres)	0	0	1	0	1
Size Class F (1,000–4,999 acres)	1	0	0	0	1
Size Class H (10,000–49,999 acres)	1	0	0	0	1
Unknown size (acreage)	0	0	13	0	13
Total	2	6	183	31	222

3.21.3.2 Fire Regime

The Project area is located in the Wyoming Basin ecoregion, which occurs throughout most of Wyoming, particularly in the central and southwest regions of the state. This ecoregion is characterized as a broad intermontane basin defined by undulating hills and low mountains, predominantly inhabited by arid grasslands and shrublands (EPA 2013). Vegetative communities in the Project area and surrounding region are typically dominated by Wyoming big sagebrush and associated species (BLM 2008b). Documentation of historical fire return intervals in sagebrush communities is complex and datasets are often incomplete, but intervals are generally classified between 60 and 100 years for Wyoming big sagebrush (BLM 2004c).

Historically, both human activities and lightning strikes have been responsible for fires occurring within Wyoming big sagebrush and basin big sagebrush communities. The peak fire season typically spanned from April to October, albeit with geographical variations. These wildfires often resulted in complete stand replacement. Considering the sagebrush communities' distribution across a productivity gradient influenced by soil temperature and moisture regimes, historical fire frequencies likely differed across the gradient. More fertile sites supporting continuous fine fuels likely experienced more frequent fires compared to sites dominated by Wyoming big sagebrush, which tended to be drier and produced fewer fine fuels, resulting in less frequent burning. The majority of fires were typically small scale, covering less than 1,200 acres, whereas larger fires exceeding 24,000 acres were infrequent. The occurrence of

larger fires was more likely following one or more cool, wet years, which facilitated the accumulation and continuity of fine fuels (Innes 2019).

The introduction and spread of cheatgrass into sagebrush ecosystems has greatly changed the fire environment. Cheatgrass and other introduced annuals out-compete native bunchgrasses and have influenced a shorter fire return interval (Innes 2019). Moreover, cheatgrass matures and desiccates earlier than most native herbaceous species it replaces, thus wildfires in cheatgrass-dominated communities tend to occur earlier in the season. This has created an unnatural grass-fire cycle, where increased disturbance leads to more cheatgrass invasion, cheatgrass establishment leads to more frequent fire-return intervals and modified fire behavior, and the increased fire disturbance regime results in more cheatgrass invasion (Innes 2019). Increased human activities add avenues for cheatgrass invasion and spread and increase the potential for ignitions in sagebrush ecosystems (Innes 2019).

3.21.3.3 Fuels

The fuels in the fire behavior analysis area (combined footprint of the Proposed Action and alternatives) were classified using Scott and Burgan's Standard Fire Behavior Fuel Models. The general classification of fuels is by fire-carrying fuel type (Scott and Burgan 2005):

- (NB) Non-burnable
- (GR) Grass
- (GS) Grass-shrub
- (SH) Shrub
- (TU) Timber-understory
- (TL) Timber litter
- (SB) Slash-blowdown

Fuels are then further classified into specific fuel models within a fuel type (e.g., GS1, GS2, GS3, and GS4 are the fuel models within the grass-shrub fuel type). The 40 fuel models are based on fuel depth, load, and other characteristics of the fuel type and are used to summarize and predict fire behavior. Generally, higher numbers indicate an increase in fuel loading.

The descriptions of all the Scott and Burgan (2005) fuel model classifications are listed in Table 3.21-2.

Table 3.21-2. Scott and Burgan Fuel Model Classifications

Fuel Model Classification	Is this a Predominant Fuel Model in the Fire Behavior Analysis Area (yes/no)?
Nearly pure grass and/or forb type (grass)	
GR1: Grass is short, patchy, and possibly heavily grazed. Spread rate is moderate (5–20 chains/hour); flame length low (1–4 feet); fine fuel load (0.40 ton/acre).	No
GR2: Moderately coarse continuous grass, average depth about 1 foot. Spread rate high (20–50 chains/hour); flame length moderate (4–8 feet); fine fuel load (1.10 tons/acre).	No
GR3: Very coarse grass, average depth 2 feet. Spread rate high (20–50 chains/hour); flame length moderate (4–8 feet).	No

Fuel Model Classification	Is this a Predominant Fuel Model in the Fire Behavior Analysis Area (yes/no)?
GR4: Moderately coarse continuous grass, average depth 2 feet. Spread rate very high (50–150 chains/hour); flame length high (8–12 feet).	No
GR5: Dense coarse continuous grass, average depth 1–2 feet. Spread rate very high (50–150 chains/hour); flame length high (8–12 feet).	No
GR6: Dryland grass about 1 to 2 feet tall. Spread rate very high (50–150 chains/hour); flame length very high (12–25 feet).	No
GR7: Moderately coarse continuous grass, average depth about 3 feet. Spread rate very high (50–150 chains/hour); flame length very high (12–25 feet).	No
GR8: Heavy, coarse, continuous grass 3 to 5 feet tall. Spread rate very high (50–150 chains/hour); flame length very high (12–25 feet).	No
GR9: Very heavy, coarse, continuous grass 5 to 8 feet tall. Spread rate extreme (> 150 chains/hour); flame length extreme (> 25 feet).	No
Mixture of grass and shrub, up to about 50% shrub cover (grass-shrub)	
GS1: Shrubs are about 1-foot high, low grass load. Spread rate moderate (5–20 chains/hour); flame length low (1–4 feet); fine fuel load (1.35 tons/acre).	No
GS2: Shrubs are 1–3 feet high, moderate grass load. Spread rate high (20–50 chains/hour); flame length moderate (4–8 feet); fine fuel load (2.1 tons/acre).	Yes
GS3: Moderate grass and shrub load, average depth less than 2 feet. Spread rate high (20–50 chains/hour); flame length moderate (4–8 feet).	No
GS4: Heavy grass/shrub load, depth greater than 2 feet. Spread rate high (20–50 chains/hour); flame length very high (12–25 feet).	No
Shrubs cover at least 50% of the site; grass sparse to non-existent (shrub)	
SH1: Low fuel load, depth about 1 foot, some grass fuels present. Spread rate very low (0–2 chains/hour); flame length very low (0–1 foot).	No
SH2: Moderate fuel load (higher than SH1), depth about 1 foot, no grass fuels present. Spread rate low (2–5 chains/hour); flame length low (1–4 feet); fine fuel load (5.2 tons/acre).	Yes
SH3: Moderate shrub load. Fuel bed depth 2–3 feet. Spread rate low (2–5 chains/hour), flame length low (1–4 feet).	No
SH4: Low to moderate shrub and litter load, possibly with pine overstory. Fuel bed depth about 3 feet. Spread rate high (20–50 chains/hour); flame length moderate (4–8 feet).	No
SH5: Heavy shrub load, depth 4 to 6 feet. Spread rate very high (50–150 chains/hour); flame length very high (12–25 feet).	No
SH6: Dense shrubs, little to no herb fuels. Fuel bed depth about 2 feet. Spread rate high (20–50 chains/hour); flame length high (8–12 feet).	No
SH7: Very heavy shrub load, possibly with pine overstory. Fuel bed depth 4–6 feet. Spread rate high (20–50 chains/hour); flame length very high (12–25 feet).	No
SH8: Dense shrubs, little to no herb. Fuel bed depth about 3 feet. Spread rate high (20–50 chains/hour); flame length high (8–12 feet).	No
SH9: Dense shrubs, significant fine fuel. Fuel bed depth 4–6 feet. Spread rate high (20–50 chains/hour); flame length very high (12–25 feet).	No
Grass or shrubs mixed with litter from forest canopy (timber-understory)	
TU1: Low load of grass and/or shrub with litter. Spread rate low (2–5 chains/hour); flame length low (1–4 feet); fine fuel load (1.3 tons/acre).	No
TU2: Moderate litter load with shrub component. Spread rate moderate (5–20 chains/hour); flame length low (1–4 feet).	No
TU3: Moderate litter load with grass and shrub components. Spread rate high (20–50 chains/hour); flame length moderate (4–8 feet).	No

Fuel Model Classification	Is this a Predominant Fuel Model in the Fire Behavior Analysis Area (yes/no)?
TU4: Fuel bed is short conifer trees with grass or moss understory. Spread rate moderate (5–20 chains/hour); flame length moderate (4–8 feet).	No
TU5: High load conifer litter with shrub understory. Spread rate moderate (5–20 chains/hour); flame length moderate (4–8 feet).	No
Dead and downed woody fuel (litter) beneath a forest canopy (timber litter)	
TL1: Low to moderate load, fuels 1–2 inches deep. Spread rate very low (0–2 chains/hour); flame length very low (0–1 foot).	No
TL2: Low load, compact. Spread rate very low (0–2 chains/hour); flame length very low (0–1 foot).	No
TL3: Moderate load. Spread rate very low (0–2 chains/hour); flame length low (1–4 feet); fine fuel load (0.5 ton/acre).	Yes
TL4: Moderate load. Spread rate very low (0–2 chains/hour); flame length low (1–4 feet).	No
TL5: High load conifer litter. Spread rate low (2–5 chains/hour); flame length low (1–4 feet).	No
TL6: Moderate load, less compact. Spread rate moderate (5–20 chains/hour); flame length low (1–4 feet).	No
TL7: Heavy load, includes larger diameter downed logs. Spread rate low (2–5 chains/hour); flame length low (1–4 feet).	No
TL8: Long needle litter; long needle fuel. Spread rate moderate (5–20 chains/hour); flame length low (1–4 feet).	No
TL9: Very high load fluffy dead and downed fuel litter. Spread rate moderate (5–20 chains/hour); flame length moderate (4–8 feet).	No
Insufficient wildland fuel to carry wildland fire under any condition (non-burnable)	
NB1: Urban or suburban development; insufficient wildland fuel to carry wildland fire.	No
NB2: Snow/ice.	No
NB3: Agricultural field, maintained in non-burnable condition.	No
NB8: Open water.	No
NB9: Bare ground.	Yes
Activity fuel (slash) or debris from wind damage (blowdown) (slash blowdown)	
SB1: Fine fuel load is 10–20 tons/acre, weighted toward fuels 1–3 inch diameter class, depth is less than 1 foot. Spread rate moderate (5–20 chains/hour); flame length low (1–4 feet).	No
SB2: Fine fuel load is 7–12 tons/acre, evenly distributed across 0-to-0.25-inch, 0.25-to-1-inch, and 1-to-3-inch diameter classes, depth is about 1 foot. Spread rate moderate (5–20 chains/hour); flame length moderate (4–8 feet).	No
SB3: Fine fuel load is 7–12 tons/acre, weighted toward 0-to-0.25-inch diameter class, depth is more than 1 foot. Spread rate high (20–50 chains/hour); flame length high (8–12 feet).	No
SB4: Blowdown is total, fuel bed not compacted, foliage still attached. Spread rate very high (50–150 chains/hour); flame length very high (12–25 feet).	No

Source: Scott and Burgan (2005).

Notes: One chain is 66 feet. Gray-shaded row = predominant fuel models that are present in the fire behavior analysis area.

The fuels in the fire behavior analysis area were characterized using LANDFIRE 2.2.0 in the Interagency Fuel Treatment Decision Support System (IFTDSS) (2022); fuel model summaries are shown in Table 3.21-3 and on Figure 3.21-2 (Appendix Q). Table 3.21-3 lists the major fuel models (greater than 10% of analysis area) present in the fire behavior analysis area; fuel models representing smaller percentages are not included in the table. The fuel models were used to model fire behavior parameters in IFTDSS.

Table 3.21-3. Fuel Models in the Fire Behavior Analysis Area

Fuel Model	Current Conditions Acres (percentage)
GS2	4,295 (49%)
SH2	1,510 (17%)
NB9	1,505 (17%)
TL3	1,168 (13%)

Source: IFTDSS (2022).

3.21.3.4 Fire Behavior

Flame Length

Weather, topography, and fuels affect fire behavior. Fire behavior can be described by flame length, fire intensity, and rate of spread (ROS), among other variables. Under current fuels conditions, fire behavior modeling indicates that flame lengths in the fire behavior analysis area would be predominantly between 4 and 8 feet (Table 3.21-4; Appendix Q, Figure 3.21-3). Shorter flame lengths are typical in fine fuels such as short grasses, whereas greater flame lengths are typical in tall grasses and woody fuel types with a heavy fuel loading.

Table 3.21-4. Modeled Flame Length in the Fire Behavior Analysis Area

Flame Length (feet)	Current Conditions Acres (percentage)
4–8	5,798.2 (66.12%)
0–4	2,970.4 (33.87%)
8–12	0.2 (< 0.01%)

Source: IFTDSS (2022).

Rate of Spread

Modeling for the fire behavior analysis area shows that most of the area (65%) would have a ROS between 5 and 20 chains (1 chain is 66 feet) per hour (Table 3.21-5; Appendix Q, Figure 3.21-4). This moderate rate of fire spread is common in flashy fuels (e.g., grasses and shrubs) with moderate loading.

Table 3.21-5. Modeled Rate of Spread in the Fire Behavior Analysis Area

Rate of Spread (chains/hour)	Current Conditions Acres (percentage)
5–20	5,705 (65%)
0–5	2,825 (32%)
20–50	239 (3%)

Source: IFTDSS (2022).

3.21.3.5 Fire Response

Fire behavior is an important component of fire response strategies and tactics. In general, fires with flame lengths less than 4 feet and rates of spread less than 20 chains/hour can be effectively controlled with direct attack suppression tactics using hand tools or heavy equipment. However, where flame lengths

would exceed 4 feet and rates of spread would exceed 20 chains/hour, suppression efforts are typically more difficult and indirect tactics need to be employed. Aviation and heavy equipment resources can be critical to fire response depending on fire behavior and location. The suppression difficulty index is one measure of the impact to response resources and fire potential. The suppression difficulty index factors in topography, fuels, expected fire behavior under severe fire weather conditions, firefighter line production rates in various fuel types, and accessibility (distance from roads/trails) to assess relative suppression effort categorized by classes from lowest to highest difficulty (Rodriguez y Silva et al. 2020). Most of the fire response analysis area indicates a low suppression difficulty index value under current conditions, with 83.1% of the entire fire behavior analysis area having a value between 0 and 20 (Table 3.21-6; Appendix Q, Figure 3.21-5). Areas with high suppression difficulty index values are noted primarily to the east of the fire behavior analysis area (surrounding region).

Fire response in the fire response analysis area is provided by several agencies under mutual aid and cooperative agreements (BLM n.d. [2004]). The capabilities and availability of these local resources to respond to wildfire vary due to staffing levels and availability, access to appropriate equipment, and response times and distances to fire ignitions. The mine permit boundary is approximately 24 miles away from the nearest fire station (Green River Fire Department), which indicates relatively longer response times to ignitions in or near the Project area. However, linear features (under the Proposed Action and alternatives) are generally closer to fire stations (Green River and Granger Fire Departments). Aerial suppression resources can be critical to slowing or minimizing fire spread in the fire response analysis area when ground resources have a longer response, or the suppression difficulty index is high. In Wyoming, primary aerial response would be headed by the BLM Southern Wyoming Heliattack module, although additional Bureau of Indian Affairs and USFS aerial resources would also be available for initial attack (BLM 2004c). During peak wildfire season, the availability of ground and aviation assets may be limited due to resources responding to other fires in the state and nationwide; some resources may be bolstered by seasonally staffed positions and stations.

Table 3.21-6. Suppression Difficulty Index in the Fire Response Analysis Area with Current Conditions

Suppression Difficulty Index Value	Fire Response Analysis Area
10–20	4,883 acres (55.7%)
0–10 (lowest)	2,405 acres (27.4 %)
20–40	1,432 acres (16.3%)
40–70	43 acres (0.5%)
70–100 (highest)	5 acres (0.1%)

3.21.3.6 Fire Ignition Risk

Existing electric utility infrastructure in the fire history (ignition impacts) analysis area is a potential source of ignitions, particularly during periods of maintenance. Indeed, several studies have noted the influence of electric infrastructure, particularly transmission lines, on increased ignition risk (Keeley and Syphard 2018; Kody et al. 2022; Syphard and Keeley 2015). Similarly, road and railroad networks have also been identified as increasing ignition risk (Grala et al. 2017; Pew and Larsen 2001; Ricotta et al. 2018; Sadasivuni et al. 2014). Access roads can increase potential sources of ignition during construction and maintenance, as well as create more avenues for increased human intrusion to the area. Increased human activity increases potential ignition sources through cigarette butts, other human-ignited materials (e.g., campfires), sparks or ignitions from vehicles, or sparks from construction, maintenance, and decommissioning activities of infrastructure. From 1992 through June 2023, there have been 98 known

human-caused fires, or 44% of all fires recorded during that period, in the fire response analysis area. Data on specific causes is incomplete, but some of the sources include utilities, railroads, camping, firearms, fireworks, and equipment.

The landscape burn probability for the fire behavior analysis areas was characterized using IFTDSS. Burn probability is the likelihood of a given location burning; it considers fire size in a location, with larger fires producing higher probabilities than smaller fires (IFTDSS 2022). A landscape burn probability also analyzes fire intensity using the mean flame length for all fires that burn in a given location. Taken together, the burn probability and mean flame length result in an integrated hazard classification. Under 97th percentile weather and current fuels conditions, most of the fire response analysis area is generally a “lowest integrated hazard,” with approximately 96% of the landscape classified as “lowest” or “lower hazard” or “non-burnable” (Table 3.21-7; Appendix Q, Figure 3.21-6).

Table 3.21-7. Modeled Landscape Burn Probability in the Fire Response Analysis Area and Fire Behavior Analysis Area with Current Conditions

Burn Probability (integrated hazard)	Fire Response Analysis Area Acres (percentage)
Lowest hazard	3,684 (42%)
Lower hazard	3,173 (36%)
Non-burnable	1,614 (18%)
Middle hazard	169 (2%)
Burnable but not burned	129 (2%)

Source: IFTDSS (2022).

3.21.4 Environmental Consequences

3.21.4.1 Analysis Method

In this analysis, it is assumed that vegetation composition and structure, along with their corresponding fuel model classifications, directly impact fire behavior and subsequent decision-making regarding fire response. The surface disturbance acreage of the main identified fuel models within the fire behavior analysis area (combined Project footprints of Alternatives B, C, and D) was examined to assess the impacts of construction activities, which accounted for the largest affected area. The impact to fuel models was calculated based on the total disturbance acres of the fuel model present in each of the alternatives compared to the acres of each fuel model in the entire fire behavior analysis area. Table 3.21-8 shows the total area of each alternative (i.e., the total area of potential surface disturbance).

Construction activity impacts to fuel models would result in future modified fire behavior (ROS and flame length), burn probability, and suppression difficulty. The impacts to fire behavior, burn probability, and suppression difficulty were calculated based on the acres of each metric present in each of the alternatives compared to the total acres of the entire fire behavior analysis area.

It is also assumed that the presence of roads, rail lines, and transmission lines may result in increased likelihood of ignition risk (Molina et al 2019). Because fuel characteristics, fire behavior metrics, burn probability, and suppression difficulty index are relatively similar for each alternative within the fire behavior and response analysis area, the impacts to ignition risk along such linear features were determined based on the mileage of proposed roads, rail lines, and transmission lines of the alternatives. It should be noted that estimated vehicular traffic through the proposed roads is expected to be the same for all alternatives.

Table 3.21-8. Total Surface Disturbance Area of the Proposed Action and Alternatives

	Alternative B	Alternative C	Alternative D
Total area (acres)	6,322	6,346	7,012

3.21.4.2 Alternative A (No Action)

Under the No Action Alternative, the Project would not be constructed. There would be no changes to the fire environment and to fire response. Existing conditions and trends in the analysis area would continue as described above in the Affected Environment section.

3.21.4.3 Alternative B (Proposed Action)

Impacts to fire environment and fire management from Project construction, operations, and decommissioning activities could include changes to fuels, increased sources of ignition, changes to fire regimes, and changes to fire response strategies.

Construction, operations, and decommissioning activities would create ground disturbance in the Project footprint that would directly impact fuels. Disturbance from human activities (e.g., use of heavy equipment; movement of soil; construction of roads, rails, and transmission lines; and the potential introduction or spread of noxious and invasive species) would change the existing vegetation composition and therefore would change fuels characteristics (Table 3.21-9) and fire behavior (Table 3.21-10 and Table 3.21-11). Shrubs and other woody species are often removed from project sites and soil compaction from activities can impact the seasonal growth of native grasses and herbaceous species (Section 3.9). This may lead to a decrease of fuel models with a shrub component in these areas and facilitate the spread of annual herbaceous species or aggressive invasives that outcompete native vegetation. For example, cheatgrass is known to both colonize spaces that naturally occur in healthy sagebrush ecosystems and quickly invade disturbed areas (Zouhar 2003). Human activities such as vehicle and foot traffic could bring noxious and invasive species into the Project footprint and increase opportunities for these species to spread (Section 3.9.1.3). The Noxious and Invasive Weed Management Plan (Appendix G of the Mine Plan) would aid in controlling the spread of noxious weeds in previously non-infested areas; however, management of invasive species such as cheatgrass is difficult once a population is established. Further, cheatgrass is not listed as a noxious weed by either the Wyoming Department of Agriculture or by Sweetwater County, meaning species monitoring and control are not regulated.

While expected fire behavior is moderate with current fuels conditions, a heavier grass component and fuel loading with greater fuel continuity, which occurs with increased spread of cheatgrass or other annual species, may increase the portion of the Alternative B that could support a ROS greater than 20 chains/hour (2%) and decrease the portion (27.02%) that could support flame lengths less than 4 feet (Table 3.21-10 and Table 3.21-11). Although the construction of new roads, railroads, and transmission line infrastructure could increase fuel discontinuity across the landscape, the remaining continuous fuels are more uniform in distribution if there is an increase in cheatgrass or annual grasses. Uniform, continuous fuels allow for easier fire spread, potentially increasing fire size.

Construction, operations, and decommissioning activities increase the sources of ignition that have the probable consequence of a new fire start. The use of tools and heavy equipment may cause sparking and could ignite surrounding vegetation. During construction, operations, and decommissioning activities, there would be an increase in vehicles and humans in the Project area. Vehicle exhaust systems contacting dry fuels, (during driving or parking), rail car brakes, and cigarette butts are common human-related fire causes. Additionally, the construction and permanent presence of electrical infrastructure increases the opportunity for arcing, sparks, and thermal failures, which may result in a new fire start. Lightning

causing thermal failures in electrical equipment is one known ignition cause. During wildfire response and suppression activities, unless equipment has been de-energized or deemed dead, water cannot be sprayed around transmission lines as they conduct current, and downed transmission lines present hazards to ground resources. Additionally, aviation resources may be impacted by the presence of overhead infrastructure during tactical decisions.

In the future, Alternative B may experience greater landscape burn probability with a higher portion categorized as having middle integrated hazard (1%). Alternative B could be classified even higher if the area is subject to increased fire starts, fire behavior, or fire size (Table 3.21-12). Although the northern portions of the proposed railroad, access road, and transmission line features of the fire behavior analysis area would be closer to ground resources (Granger Fire Department), the southern portions of these features would be more than 15 miles from ground resources, thus response time could be long and increased fire behavior could lead to greater fire spread under certain conditions (Table 3.21-13). Similarly, a change in fuel types and a potential increase in fire behavior may increase the portion of Alternative B that experiences a high suppression difficulty index value (Table 3.21-14). An increase in fire behavior, burn probability, and suppression difficulty in combination with long response times and modified suppression tactics may impact fire response decisions and activities.

The impacts to fuels can subsequently alter fire regimes. Cheatgrass and other annuals, which outcompete native bunchgrasses, cure out, and thus are available to burn in a shorter time frame than historically native vegetation, including earlier in the season. This has created an unnatural grass-fire cycle where increased disturbance leads to more cheatgrass invasion, cheatgrass establishment leads to more frequent fire-return intervals and modified fire behavior, and the increased fire disturbance regime results in more cheatgrass invasion. Some native species, such as sagebrush, are not adapted to such frequent fire-return intervals, further advancing the spread of nonnative species over regrowth of native vegetation post-disturbance. Continuous, uniform fuels like cheatgrass also result in higher severity fires than were historically typical in sagebrush ecosystems. Because cheatgrass is not listed as a noxious weed by either the Wyoming Department of Agriculture or Sweetwater County, monitoring would be needed at the Project level. These types of changes to the fire environment may require a reevaluation of fire management activities, including future fuels treatments.

Overall, the expected impact from construction activities would be low to moderate because most of the fire behavior analysis area is categorized as lower-lowest hazard (78%) or non-burnable (18%) in terms of burn probability. Moreover, the majority of the fire behavior analysis area (83.1%) is classified as having a low fire suppression difficulty index value. Hence, effectively managing the spread of cheatgrass and other introduced annuals, which consequently leads to alterations in vegetation and composition and structure, would result in minimal changes to fire behavior. Landscape burn probability has the potential for the greatest change with the increased ignition sources.

Table 3.21-9. Modeled Fuel Types Present in the Fire Behavior Analysis Area under Current Conditions

Fuel Model	Alternative B Acres (percentage)	Alternative C Acres (percentage)	Alternative D Acres (percentage)
GS2	2,860 (33%)	2,863 (33%)	3,575 (41%)
NB9	1,273 (15%)	1,295 (15%)	1,089 (12%)
SH2	1,104 (13%)	1,100 (13%)	1,222 (14%)
TL3	954 (11%)	953 (11%)	970 (11%)

Note: Percentage reflects the amount of the total resource present in the fire behavior analysis area affected by each alternative.

Table 3.21-10. Proposed Action and Alternatives with Modeled Rate of Spread under Current Conditions in the Fire Behavior Analysis Area

Rate of Spread (chains/hour)	Alternative B Acres (percentage)	Alternative C Acres (percentage)	Alternative D Acres (percentage)
0–5	2,326 (27%)	2,351 (27%)	2,139 (24%)
5–20	3,836 (44%)	3,837 (44%)	4,710 (54%)
20–50	159 (2%)	158 (2%)	163 (2%)

Note: Percentage reflects the amount of the total resource present in the fire behavior analysis area affected by each alternative.

Table 3.21-11. Proposed Action and Alternatives with Modeled Flame Length under Current Conditions in the Fire Behavior Analysis Area

Flame Length (feet)	Alternative B Acres (percentage)	Alternative C Acres (percentage)	Alternative D Acres (percentage)
0–4	2,369.1 (27.02%)	2,401.3 (27.38%)	2,214.7 (25.26%)
4–8	3,952.3 (45.07%)	3,944.3 (44.98%)	4,797.1 (24.71%)
8–12	0.2 (< 0.01%)	0.2 (< 0.01%)	0.0 (0%)

Note: Percentage reflects the amount of the total resource present in the fire behavior analysis area affected by each alternative.

Table 3.21-12. Proposed Action and Alternatives with Modeled Landscape Burn Probability under Current Conditions in the Fire Behavior Analysis Area

Landscape Burn Probability Acres (integrated hazard)	Alternative B Acres (percentage)	Alternative C Acres (percentage)	Alternative D Acres (percentage)
Burnable but not burned	93 (1%)	98 (1%)	72 (1%)
Non-burnable	1,330 (15%)	1,358 (15%)	1,135 (13%)
Lower hazard	2,143 (24%)	2,136 (24%)	2,702 (31%)
Lowest hazard	2,674 (30%)	2,673 (30%)	2,942 (34%)
Middle hazard	82 (1%)	80 (1%)	160 (1%)

Note: Percentage reflects the amount of the total resource present in the fire behavior analysis area affected by each alternative.

Table 3.21-13. Proposed Action and Alternatives with Miles of Linear Features

Linear Feature	Alternative B	Alternative C	Alternative D
Access roads (combined)	16 miles	19 miles	19 miles
Transmission line	17 miles	23 miles	30 miles
Rail line	21 miles	21 miles	21 miles

Table 3.21-14. Proposed Action and Alternatives with Suppression Difficulty Index under Current Conditions in the Fire Behavior Analysis Area

Suppression Difficulty Index Value	Alternative B Acres (percentage)	Alternative C Acres (percentage)	Alternative D Acres (percentage)
0–10 lowest difficulty	1,937 (22%)	1,975 (23%)	1,709 (19%)

Suppression Difficulty Index Value	Alternative B Acres (percentage)	Alternative C Acres (percentage)	Alternative D Acres (percentage)
10–20	3,310 (38%)	3,302 (38%)	4,092 (47%)
20–40	1,046 (12%)	1,041 (12%)	1,170 (13%)
40–70	24 (< 1%)	23 (< 1%)	36 (< 1%)
70–100 highest difficulty	5 (< 1%)	5 (< 1%)	4 (< 1%)

Note: Percentage reflects the amount of the total resource present in the fire behavior analysis area affected by each alternative.

3.21.4.4 **Alternative C**

Impacts to fire environment and fire response from Alternative C would slightly differ from those described under Alternative B. The main differences between Alternative C and Alternative B are the placement of the transmission line and the extension of the northern access road (along I 80 east). Under Alternative B, the transmission line would total approximately 17 miles, whereas the transmission line under Alternative C would total approximately 23 miles. Moreover, the transmission line under Alternative C would occur along most of the proposed northern access road, whereas the transmission line under Alternative B would occur along an independent path (away from the proposed northern access road). Therefore, although Alternative C's transmission line would cover a greater distance, it would likely facilitate management of invasive grasses by localizing the disturbance area. In addition, ignitions along Alternative C's transmission line would be relatively easier to access because most of the line would occur along the proposed northern access road.

The current vegetation composition in and around the proposed transmission line under Alternative C is comparable to Alternative B. Similarly, it may experience a decrease in the shrub component or see an increase in cheatgrass or other annuals with construction and operations activities (Table 3.21-9). Under current conditions, expected fire behavior and burn probability from Alternative C (Tables 3.21-10–3.21-14) would be similar to Alternative B. Construction and operations activities may lead to a higher portion of Alternative C that could experience a ROS greater than 20 chains/hour (46%) and decrease the portion (27.38%) that could experience flame lengths less than 4 feet if there is an increase in the spread of cheatgrass or similar species. Construction and operations activities may cause Alternative C to experience an increase in the portion categorized as “middle hazard” (1%), or may even be classified higher, if there is an increase in fire starts, fire behavior, or fire size. Fire response may experience an increase in the number of incident responses because of additional fire starts, and initial attack response tactics may be impacted by the increased presence of electrical infrastructure and increased fire behavior. Coupled with longer response times for ground resources along the southern portions of the proposed access road, this may lead to an increase in suppression difficulty under Alternative C (Table 3.21-14).

3.21.4.5 **Alternative D (Preferred Alternative)**

Impacts to fire environment and fire response from Alternative D would moderately differ from those described under Alternative B. There are several differences between Alternative B and Alternative D. Under Alternative D, the mine processing facility and associated features would be placed to the north of I 80; and the mine access road and transmission line would be placed jointly and travel directly north of the Project area. Moreover, Alternative D would comprise a larger area (7,012) acres, which would be approximately 700 acres more than Alternative B (Table 3.21-8). There are also slightly more fuels with a shrub component under Alternative D (55%) than under Alternative B (46%), which may experience a decrease in the shrub component or see an increase in cheatgrass or other annuals with construction, operations, and decommissioning activities (Table 3.21-9). Fire behavior metrics are relatively similar to Alternative B, with the exception that Alternative B would have a higher percentage (45%) of area classified with rates of spread greater than 4 feet (Alternative D has 25%) (Table 3.21-10 and 3.21-11).

Construction, operations, and decommissioning activities may lead to a higher portion of Alternative D that could experience a ROS greater than 20 chains/hour (2%) and decrease the portion (25%) that could experience flame lengths less than 4 feet if there is an increase in the spread of cheatgrass or similar species. Regarding fire suppression difficulty index and burn probability, Alternative D and Alternative B would have similar metrics (Table 3.21-12 and 3.21-14), with most of the area comprising low burn probability and low fire suppression difficulty. Alternative D may experience an increase in the portion categorized as “middle hazard” (1%), or could be classified higher, if there is an increase in fire starts, fire behavior, or fire size. Fire response may experience an increase in the number of incident responses because of additional fire starts, and initial attack response tactics may be impacted by the increased presence of electrical infrastructure and increased fire behavior. Coupled with longer response times for ground resources along the southern portion of the proposed access road, this may lead to an increase in suppression difficulty with Alternative D (Table 3.21-14).

Lastly, Alternative D would have more miles of road and transmission line than Alternative B (Table 3.21-13). It should be noted, however, that the transmission line under Alternative D would occur jointly with the proposed northern access road, whereas the transmission line under Alternative B would occur along an independent path (away from the proposed northern access road). Therefore, although Alternative D’s transmission line would cover a greater distance, it would likely facilitate management of invasive grasses by localizing the disturbance area. In addition, ignitions along Alternative D’s transmission line would be relatively easier to access because most of the line would occur along the proposed northern access road.

3.21.4.6 Summary

Table 3.21-15 summarizes the direct and indirect impacts to the fire environment and fire response using key metrics for Alternatives B, C, and D. In general, the impacts from each of these alternatives are similar in type and only vary due to placement of linear features (e.g., transmission line, access road, etc.), length of access roads and transmission lines, disturbance footprint (acreage impacted), and specifics in current vegetation composition (fuel models). The footprints of Alternatives B, C, and D would occur in areas that exhibit low burn probabilities, low fire suppression difficulties, and low rates of fire spread. However, there are areas of the Project footprint where the closest ground resources are more than 15 miles away. As compared to Alternative B, the major differences are as follows:

- Alternative D would have the highest percentage of fuel models with a shrub component, as well as the largest disturbance acreage (Project footprint). With ground-disturbing activities, the disturbance area could experience the most change in vegetation composition (decreased shrub cover) and increased likelihood of spread of cheatgrass and similar species in naturally occurring spaces between shrubs or where shrubs have been removed.
- Alternative D could experience the greatest increase to the grass fuel loading and fuel continuity from construction, operations, and decommissioning activities given their higher shrub component and potential shrub loss. The disturbance area could see an increase in ROS for a larger percentage of the area with the fuel type change.
- Alternatives C and D would have more mileage of access roads and transmission line. With increased traffic and more miles of transmission line, ignitions could potentially increase. This may lead to fire response experiencing an increase in the number of incident responses, and initial attack response strategies may be impacted by the increased presence of electrical infrastructure.

Table 3.21-15. Proposed Action and Alternatives with Impacts in the Fire Behavior Analysis Area with Current Conditions

	Alternative B	Alternative C	Alternative D
Percent of fuel models with shrub component	46%	46%	55%
Percent medium hazard (burn probability)	1%	1%	1%
Percent of ROS 0–20 chains/hour	71%	71%	78%
Percent of flame lengths 0–4 feet	27%	27%	25%
Percent suppression difficulty index value > 40	< 1%	< 1%	< 1%

3.21.4.7 *Irretrievable and Irreversible Impacts and Short-Term Uses Versus Long-Term Productivity*

Potentially irretrievable impacts from the Proposed Action and Alternatives C and D could include changes in vegetation composition and structure (fuel type), increased risk of establishment and spread of invasive and noxious weed species, modified fire behavior, increased sources of ignition, and modified fire suppression response and tactics. Surface disturbance would be associated with construction, operations, and decommissioning activities resulting in short-term impacts (construction disturbance), long-term (life of the Project) impacts, and potential irreversible impacts (post-decommissioning).

Instances where construction activities would permanently change vegetation composition and structure (e.g., permanent loss of shrub component or increased spread of uniform, continuous grasses such as cheatgrass) would present irreversible impacts to the fire environment, indirectly affecting future fire behavior, burn probability, suppression difficulty, and fire response strategies and decisions.

The dynamics of climate change and wildfires are intricate, but some general predicted trends, such as increased temperatures and widespread drought in the western United States, lead to a higher availability of fuels for burning. This, in turn, makes wildfire suppression more challenging, not only in the fire response analysis area but also in surrounding regions. Furthermore, long-term drought negatively impacts many native species, like sagebrush, making them more vulnerable to competition from aggressive nonnative species like cheatgrass. Although models may not provide precise predictions of climate change specifics, it is evident that the fire environment would be impacted.

3.21.4.8 *Cumulative Impacts*

Cumulative impacts from past, present, and RFFAs include changes in vegetation composition and structure (fuel type), increased risk of establishment and spread of invasive and noxious weed species, modified fire behavior, increased sources of ignition, and modified fire suppression response and tactics. These RFFAs include mine development, telecommunication cables (underground) and facilities improvements, trail installations and enhancements, paleontological excavations, and installation of recreational vehicle stations. Surface disturbance would be associated with both construction and operations activities, as well as general use, resulting in short-term impacts, long-term (life of the Project) impacts, and potential irreversible impacts. Overall, the potential cumulative disturbance acreage in the vicinity of the fire behavior analysis area is approximately 39,442 acres.

The American Soda Solution Mining Expansion (35,668 acres) and West Soda (3,722 acres) mining projects would likely have similar impacts as the Proposed Action (Alternative B) to fire and fuels due to the similarity of project types (i.e., mine development) and the relative homogeneity of the fire environment within the fire behavior analysis area (i.e., relatively homogenous fuels and modeled fire behavior metrics). However, the extent of impacts would be contingent upon Project specifics (e.g.,

Project area, installation of linear features, transmission lines, etc.). Moreover, if more surface area (vegetation) is disturbed, the higher the chance for the introduction of invasive species such as cheatgrass and subsequent changes to fire behavior and fire response. Additionally, the presence of additional mining facilities in the area, along with additional roads and transmission lines, would increase the likelihood for human-caused ignitions (e.g., vehicle- and equipment-caused ignitions).

RFFAs such as the Skyline ADA Trail (11 acres) and Wilkins Peak Mountain Bike Trail Expansion (38 acres) projects would also be surface-disturbing activities and would create additional access points for recreational activities. Therefore, these RFFAs have the potential to impact the fire environment (e.g., invasive species encroachment and increased human-caused ignition). However, it should be noted that these trails can also function as fire lines and/or access points for fire personnel.

The 2023 Tate Museum Paleontological Excavation Near Needles Reservoir (< 0.1 acre) would be another surface-disturbing activity and thus has the potential to alter fuels within the disturbed area. Additionally, a larger area than the excavation site might be disturbed should a temporary, unimproved road be installed. If a temporary road is required, it would create additional access points for the public to previously inaccessible or difficult-to-access lands, thus increasing the probability of human-caused ignitions; however, it is worth noting that the paleontological excavation project is expected to be brief in duration and would have a small footprint.

Other surface-disturbing RFFAs include the Green River to Buckboard Fiber Optic (3 acres) and the four-stall Recreational Vehicle Installation (< 0.1 acre) projects; however, surface disturbance due to the installation of 4 miles of fiber optic cable is expected to be temporary because it would be buried underground. Potential impacts of both projects include changes to fuels via invasive encroachment and increased human-caused ignitions during construction and operations. The facilities may also increase human presence for operations, maintenance, and general use and thus have the potential to increase human-caused ignitions.

Non-surface-disturbing RFFAs include road improvement projects such as pavement rehabilitation (e.g., resurfacing and maintenance), structure repairs, road safety improvements (e.g., safety signage, roadway striping, and pedestrian crossings), and intersection improvements (e.g., roadway striping and sidewalk and curb improvements). Because these RFFAs are anticipated to be non-surface disturbing and would not alter fuels, they are not expected to exert a significant influence on the fire environment.

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CHAPTER 4. CONSULTATION AND COORDINATION

4.1 Public Outreach and Public Involvement

4.1.1 Public Scoping

The BLM conducted public involvement activities throughout the development of this Final EIS. On April 28, 2022, at the outset of the Project, an NOI was published in the *Federal Register* that initiated a formal public scoping period, which concluded on June 17, 2022. In addition to publication of the NOI, the BLM issued a press release on May 12, 2022, and emailed a scoping notice on May 13, 2022, to a list of interested persons, organizations, and government agencies. The USFS also made the scoping documents available on their website (<https://www.fs.usda.gov/project/ashley/?project=59259>) and notified their online subscribers of the scoping period.

The BLM's goal during the scoping period was to actively seek public comment on issues of concern related to the Proposed Action and preliminary alternative concepts (40 CFR 1501.9), including other potential Project alternatives that might also achieve the stated purpose and need (Section 1.3) and address possible resource conflicts that had not already been identified.

A virtual (i.e., internet-based) public scoping meeting was conducted on June 2, 2022, from 4:00 to 6:00 p.m. Mountain Time. The BLM decided to hold the meeting online rather than as a customary in-person gathering in response to safety concerns related to the coronavirus pandemic, and in accordance with guidance from national and state health officials. The virtual meeting took place via the Zoom Webinar platform. The meeting consisted of a brief introduction of meeting panelists; a video presentation describing the NEPA process, the proposed Project, and how to submit scoping comments; and a 90-minute question-and-answer session. Attendees were asked to register before the meeting but could also register any time during the meeting. A meeting panel consisting of four BLM staff, one Pacific Soda representative, and two representatives of the EIS third-party contractor answered questions from the public. The public was able to ask unlimited questions of the panel both verbally and in writing using the webinar question tool.

The BLM received 15 comment submittals during the scoping period. Six comment submittals were received via the BLM's E-Planning website, and the remaining nine comment letters were submitted via email. These included comments from organizations, private entities, and government agencies. The BLM considered these submitted comments during development of the Project alternatives and the impact analyses included in this Final EIS. For more information and details regarding the scoping process and comments received, refer to the scoping report (Appendix B).

4.1.2 Public Review of the Draft EIS

The BLM published the Notice of Availability for the Draft EIS for public review and comment in the *Federal Register* on August 9, 2024. This notice initiated the 45-day public comment period, which ended on September 23, 2024. A press release was made available on August 8, 2024, which provided key Project details and information regarding the public meeting. Copies of the Draft EIS were made available to affected federal, state, and local government agencies and Native American Tribes. Bound hardcopies of the Draft EIS were made available for public inspection at the BLM Kemmerer Field Office, BLM Rock Springs Field Office, and Sweetwater County Public Library.

An in-person public meeting was conducted on September 5, 2024, at the Hampton Inn in Green River, Wyoming. A total of 17 people attended this meeting. The meeting consisted of an open-house style

meeting with stations organized around the room that provided information regarding specific resources, the NEPA process, and how to provide comments. Attendees visited the stations, asked questions, and had one-on-one conversations with BLM staff. An opportunity to provide written comments was provided in the meeting room; however, no written comments were submitted during the meeting.

The BLM received 13 public comment submittals during the 45-day public comment period for the Draft EIS. Of these, 12 submittals were received via E-Planning and one submittal was received via email. From the 13 comment submittals, a total of 115 unique and substantive comments were identified. These comments and associated responses are included in Appendix T.

Even though the formal scoping period and the Draft EIS public comment period had defined start and end dates, the BLM has continued to foster public involvement throughout the EIS process. The Final EIS will be available for a 30-day public review period prior to issuance of the ROD.

Any selected alternative involving USFS lands will require a separate decision issued by that agency. In compliance with USFS regulations, that portion of the Project is subject to the objection process described in 36 CFR Subparts A and B. Submitting timely, specific comments during the 45-day comment period will afford you the eligibility to object to a future draft decision on the proposed activities on USFS lands.

4.2 Tribal Consultation

The BLM is conducting ongoing consultation with Tribes on a government-to-government level in accordance with EO 13175, Consultation and Coordination with Indian Tribal Governments (November 6, 2000) and the Presidential Memorandum on Tribal Consultation and Strengthening Nation-to-Nation Relationships. Tribal consultation is ongoing and will continue throughout the life of the Project (see Appendix G).

The BLM is consulting with the following four Tribes: Eastern Shoshone Tribe of the Wind River Reservation, Northern Arapaho Tribe, Ute Tribe of the Uintah and Ouray Reservation, and Shoshone-Bannock Tribes of the Fort Hall Reservation. The BLM sent certified consultation letters to the leadership of the four Tribes (and cc'd the Tribal Historic Preservation Officers) in December 2020 to inform them of the Proposed Action and to initiate Tribal consultation. On May 27, 2022, after the NOI was published in the *Federal Register* and the NEPA process was initiated, the BLM sent certified letters to the leadership of the same four Tribes. The purpose of the 2022 letters was to inform the Tribes that the NOI had been published and to provide the date and details of the public scoping meeting.

In addition to sending certified letters, the BLM followed up with the Tribes on multiple occasions via email to do the following:

- Ensure that the certified letters had been received and to send an electronic version of the letters to Tribal leadership and the Tribal Historic Preservation Officers.
- Invite the Tribes to field visits and coordinate logistics regarding field visits.
- Share Project GIS data, maps, and other information.
- Inform the Tribes of changes to the Proposed Action and alternatives.
- Coordinate the involvement of Tribal monitors.

A total of 29 emails were sent to Tribal representatives between May 31, 2022, and October 4, 2023.

The BLM invited the four Tribes to a field visit of the proposed Project area. On June 28, 2023, the BLM conducted the field visit with the Tribal archaeologist of the Northern Arapaho Tribal Historic Preservation Office. Representatives from the Eastern Shoshone, Shoshone-Bannock, and Northern Ute Tribes did not attend the field visit. To date, no TCPs have been identified in the Project area by the Tribes. A second site visit was conducted on August 6, 2024, with the Tribal archaeologist of the Northern Arapaho Tribal Historic Preservation Office. The purpose of the site visit was to discuss mitigation strategies for geotechnical activities related to the proposed ponds near the northern processing facilities.

4.3 Agency Coordination

To comply with Section 7 of the ESA, the BLM consulted with the USFWS to develop a Biological Assessment. The Biological Assessment analyzes the potential impacts from implementation of the proposed Project (as described in the Preferred Alternative) on the endangered bonytail (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), and razorback sucker (*Xyrauchen texanus*); the threatened humpback chub (*Gila cypha*); and their associated critical habitats. BLM submitted the Biological Assessment (Appendix V) to the USFWS on November 6, 2024, to initiate federal interagency formal consultation in accordance with Section 7(a)(2) of the ESA. The USFWS issued a Biological Opinion (Appendix V) for the Dry Creek Trona Mine Project on January 15, 2025. The Biological Opinion concludes that the Project, as proposed, is not likely to jeopardize the continued existence of the listed Colorado River fishes and is not likely to destroy or adversely modify designated critical habitat or result in destruction or adverse modification of designated critical habitat. Furthermore, it concludes that the Recovery Program, conservation measures, and additional mitigation funded by Pacific Soda, adequately addresses effects to the Colorado River fishes and their designated critical habitat.

The BLM invited several federal, state, and local government agencies and Tribal governments that have jurisdiction or special expertise to become cooperating agencies and actively participate in the preparation of this Final EIS. Table 4.3-1 lists the agencies BLM has contacted.

Table 4.3-1. Agencies Invited to be Cooperating Agencies

Jurisdiction	Agency
Federal	U.S. Forest Service
	U.S. Environmental Protection Agency
	National Park Service
State	Wyoming Department of Agriculture
	Wyoming Department of Environmental Quality
	Wyoming Game and Fish Department
	Wyoming Governor's Office
	Wyoming Office of Outdoor Recreation
	Wyoming Office of State Lands and Investments
	Wyoming State Engineer's Office
	Wyoming State Historic Preservation Office
	Wyoming State Parks, Historic Sites, and Trails

Jurisdiction	Agency
County/Local	Lincoln County Commissioners
	Lincoln County Conservation District
	Sweetwater County Commissioners
	Sweetwater County Conservation District
	Uinta County Commissioners
	Uinta County Conservation District
	City of Green River
	Town of Granger
	Coalition of Local Governments
Tribal	Northern Arapaho Tribe
	Ute Tribe of the Uintah and Ouray Reservation
	Eastern Shoshone Tribe of the Wind River Reservation
	Shoshone-Bannock Tribes of the Fort Hall Reservation

MOUs were developed between the cooperating agencies and the BLM to formalize the relationship and provide a framework for cooperation and coordination to successfully complete the EIS in a timely, efficient, and thorough manner; and to describe the respective roles, responsibilities, and expertise of each entity in the NEPA process. The following agencies agreed to formally participate in this EIS process through an MOU:

- Lincoln County Commissioners
- Lincoln County Conservation District
- Sweetwater County Commissioners
- Sweetwater County Conservation District
- Uinta County Commissioners
- Uinta County Conservation District
- City of Green River
- Town of Granger

4.4 List of Preparers

The BLM established an interdisciplinary team made up of the BLM staff specialists to develop the EIS (Table 4.4-1). The BLM also worked with the representatives of the cooperating agencies shown above and with a third-party contractor, SWCA Environmental Consultants and its subcontractors, as shown in Table 4.4-2, to assist in development of the content and analysis in the EIS.

Table 4.4-1. Bureau of Land Management Interdisciplinary Team

Name	Project Role/Responsibility
Kemmerer Field Office	
Kelly Lamborn	Project Manager

Name	Project Role/Responsibility
Jacob Earnhart	Technical Reviewer
Beth Kruzam	Wildlife
Jace Stott	Livestock Grazing
Abigail Stemmler	Forestry
Melissa Fisher	Soils, Vegetation, Weeds, Air Quality, Climate Change, Hazardous Materials
Blaine Potts	Recreation, VRM
Phil Lockwood	Fire and Fuels
Alex Gardner	Fisheries, Riparian
Karsyn Lamb	Socioeconomics
Ben Molitor	Soils, Vegetation, Hazardous Materials
Janet Bellis	Hydrology
Rock Springs Field Office	
Joanna Nara-Kloepper	Mining Lead
Eric Roberts	Mining Engineer
Lisa Aleshire	Lands and Realty
Katie Goidich	Cultural Resources
Mark Snyder	Wildlife
Miguel Valdez	Wildlife
Gene Smith	Paleontological Resources
TJ Franklin	Soils, Vegetation
Spencer Allred	Livestock Grazing
Lauren Hazzard	Recreation, Visual Resources
Dennis Doncaster	Hydrology
Jay D'Ewart	Wild Horses
Holly Goggin	Geologist
Wyoming State Office	
Ryan McCammon	Air Quality
Wendy Huber	NEPA Compliance
Amy Stillings	Socioeconomics
National Operations Center	
Charis Cooper	Air Quality
Bret Anderson	Air Quality
Craig Nicholls	Air Quality

Table 4.4-2. Third-Party Contractor: SWCA Environmental Consultants

Name	Project Role/Responsibility
Bryan Klyse	Project Manager
Stephanie Blochowiak	Assistant Project Manager
Matt Petersen	Senior NEPA Advisor

Name	Project Role/Responsibility
Kristin Buskirk	Project Coordinator
Jennifer Malavasi	Fisheries
Doug Faulkner	Wildlife
Tim Clute	Greater Sage-Grouse, Vegetation Resources
Lia Webb	Soils, Wetlands
Haley Monahan	Vegetation Resources
Emma Clinton	Livestock Grazing
Ryan Rausch	Recreation Lead
Aaron Gannon	Recreation Support
Laura DeLio	Travel and Transportation, Lands and Realty
Heath Byrd	Socioeconomics Lead
Oliver Pahl	Socioeconomics Support
Annie Ng	Socioeconomics Support
Melanie Medeiros	Cultural Resources Lead, Paleontological Resources
Naomi Ollie	Cultural Resources Support
Georgia Knauss	Paleontological Resources
Chris Bockey	Visual Resources Lead
Garet Openshaw	Visual Resources Support
Brad Sohm	Air Quality/Climate Change Lead
Carlos Ituarte-Villarreal	Air Quality Modeling
Ellen Kraus	Air Quality
Kristie Kilgore	Geology and Minerals
Montiel Ayala	Fire and Fuels
Jim Dawson	Human Health and Safety
Allen Stutz	GIS
Rachel Johnson	GIS
Jacob Gray	GIS
Kerri Linehan	Technical Editor/Production Lead
Ramboll (subcontractor to SWCA)	
Krish Vijayaraghavan	Air Quality Modeling Lead
Jelena Popovic	Air Quality Modeling Support
Lynsey Parker	Air Quality Modeling Support
Jeremiah Johnson	Air Quality Modeling Support
Montgomery & Associates (subcontractor to SWCA)	
Chris Cottingham	Hydrology/Hydrogeology
Gregory Nelson	Hydrology/Hydrogeology