BLM
NEVADA Elko District, Tuscarora Field Office

United States Department of the Interior
Bureau of Land Management

Environmental Assessment
Huntington Valley Oil and Gas Exploration Project

DOI-BLM-E200-NV-2014-0003-EA

BLM Case File Number: NVN-090953, NVN-090954, NVN-79024, NVN-090950, NVN-081147, NVN-090948, NVN-090949, NVN-090951, NVN-081140, NVN-081141, NVN-081142, NVN-081137, NVN-081138, NVN-084378, NVN-078690

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TABLE OF CONTENTS

List of Figures

List of Maps

List of Tables

List of Appendices

List of Abbreviations and Acronyms

ug/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
AAQS	Ambient Air Quality Standards
ADT	average daily traffic
amsl	above mean sea level
AO	Authorized Officer
APDs	Applications for Permit-to-Drill
APE	Area of Potential Effect
AQRVs	Air Quality Related Values
Aqua Program	Aquifer Quality Assessment Program
AUMs	animal unit months
BAPC	Bureau of Air Pollution Control
BAQP	Bureau of Air Quality Planning
BBCS	Bird and Bat Conservation Strategy
BBS	Breeding Bird Survey
BCC	Birds of Conservation Concern
BCR	Bird Conservation Regions
BEA	Bureau of Economic Analysis
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BMPs	Best Management Practices
BOPE	Blowout Preventer Equipment
BWQP	Bureau of Water Quality Planning
Brennan	J.C. Brennan & Associates, Inc.
BTEX	benzene, toluene, ethyl benzene, and xylene
^oC	degrees centigrade
CASTNET	Clean Air Status and Trends Network
CCD	Census County Division
Census Bureau	U.S. Census Bureau
CESAs	Cumulative Effects Study Areas
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane

CNHT	California National Historic Trail
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COAs	Conditions of Approval
CR	County Road
CRA	Cultural Resource Analysts, Inc.
CWMA	Cooperative Weed Management Area
DIC	dissolved inorganic carbon
DOI	U.S. Department of the Interior
DPS	Distinct Population Segment
DRI	Desert Research Institute
DTW	depth to water
EA	Environmental Assessment
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
^oF	degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FHA	Federal Highway Administration
FLMs	Federal Land Managers
FLPMA	Federal Land Policy and Management Act
FML	federal mineral lease
FMUs	Fire Management Units
ft^2/day	square feet per day
ft^3/day	cubic feet per day
GHGs	greenhouse gases
GIS	Geographic Information System
GWP	Global Warming Potential
HAPs	hazardous air pollutants
HUC	Hydrologic Unit Code
HWA	Hayden-Wing Associates
IDA	International Dark-Sky Association
IM	Instruction Memorandum
IMPROVE	Interagency Monitoring of Protected Visual Environments
JBR	JBR Environmental Consultants, Inc.
KAPs	Key Acoustic Points
KCL	potassium chloride
km	kilometer
KOP	Key Observation Point
LCT	Lahontan cutthroat trout
MBTA	Migratory Bird Treaty Act
MCL	Maximum Contaminant Level
mg/L	milligrams per liter
mi^2	square miles
MLA	Mineral Leasing Act
MOU	Memorandum of Understanding
mph	miles per hour
MSDS	Material Safety Data Sheets
MSUPO	Master Surface Use Plan of Operations
MWD	measurement while drilling
NAAQS	National Ambient Air Quality Standards
NADP	National Acid Deposition Program
NAGPRA	Native American Graves Protection Act
NDEP	Nevada Division of Environmental Protection

NDETR	Nevada Department of Employment, Training and Rehabilitation
NDOA	Nevada Department of Agriculture
NDOM	Nevada Division of Minerals
NDOT	Nevada Department of Transportation
NDOW	Nevada Department of Wildlife
NDT	Nevada Department of Taxation
NDWR	Nevada Division of Water Resources
NEPA	National Environmental Policy Act
Nevada AAQS	Nevada Ambient Air Quality Standards
NGSCT	Nevada Governor's Sage-grouse Conservation Team
NHPA	National Historic Preservation Act
NNHP	Nevada Natural Heritage Program
NO_2	nitrogen dioxide
NOx	nitrogen oxides
Noble	Noble Energy, Inc.
NPS	National Park Service
NRC	Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRS	Nevada Revised Statutes
NSDO	Nevada State Demographer's Office
NSPS	New Source Performance Standards
NTN	National Trends Network
NTT	National Technical Team
NWI	National Wetlands Inventory
NWS	National Weather Service
O_3	ozone
OCTA	Oregon California Trails Association
OHV	off-highway vehicle
pCi/L	picocurries per liter
PFYC	Potential Fossil Yield Classification
PGH	Preliminary General Habitat
PM_{10}	particulate matter less than 10 microns in effective diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in effective diameter
PMU	Population Management Unit
PPH	Preliminary Priority Habitat
ppm	parts per million
PSD	Prevention of Significant Deterioration
psi	pounds per square inch
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
RFFAs	Reasonably Foreseeable Future Actions
RMP	Resource Management Plan
ROD	Record of Decision
RV	recreational vehicle
SAD	Surface Area Disturbance
SAR	sodium adsorption ratio
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SOx	sulfur oxides
SR	State Route
TDS	total dissolved solids
TMDL	Total Maximum Daily Load
tpy	tons per year
UIC	Underground Injection Control
US	U.S. Highway
USC	United States Code

USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOCs	volatile organic compounds
VRM	Visual Resource Management
WRCC	Western Regional Climate Center
WSAs	Wilderness Study Areas

CHAPTER 1 - INTRODUCTION

1.1 IDENTIFYING INFORMATION

BACKGROUND:

In November 2013, Noble Energy, Inc. (Noble) submitted to the Bureau of Land Management (BLM) a Master Surface Use Plan of Operations (MSUPO) for the proposed Huntington Valley Oil and Gas Exploration Project. The MSUPO was updated in January 2014 and in May 2014. The Proposed Action is for a maximum of 20 wells on up to 20 well pads including construction, drilling, completion, production/operation, and abandonment. Noble has identified 39 potential well pad locations within the Project Area; however, no more than 20 well pad locations would be constructed periodically over 2 years with a maximum of 5 years. During the fall of 2013, Noble conducted a 3D Seismic program within the Huntington Valley Project Area. Noble would use the results of the seismic program, previous 2D geothermal seismic programs, and previous well results from the Project Area to select locations that minimize the likelihood of encountering drilling hazards and increase the understanding of faults which may act as a conduit for fluids in the reservoir.

Noble submitted an application for permit-to-drill (APDs) for three exploration wells on two well pads. The remainder of the well pads and wells would be constructed during the following years. If proven economical, the wells would be produced for an estimated 20 years. Seismic listening wells which may later be converted to production wells may be constructed. Within the Project Area, existing roads would be used, some roads would require upgrading, and new local and resource roads would be required to access the well pads and the gravel pits that would provide gravel for access road and well pad construction. The authorized work would begin once all permits and approvals are obtained.

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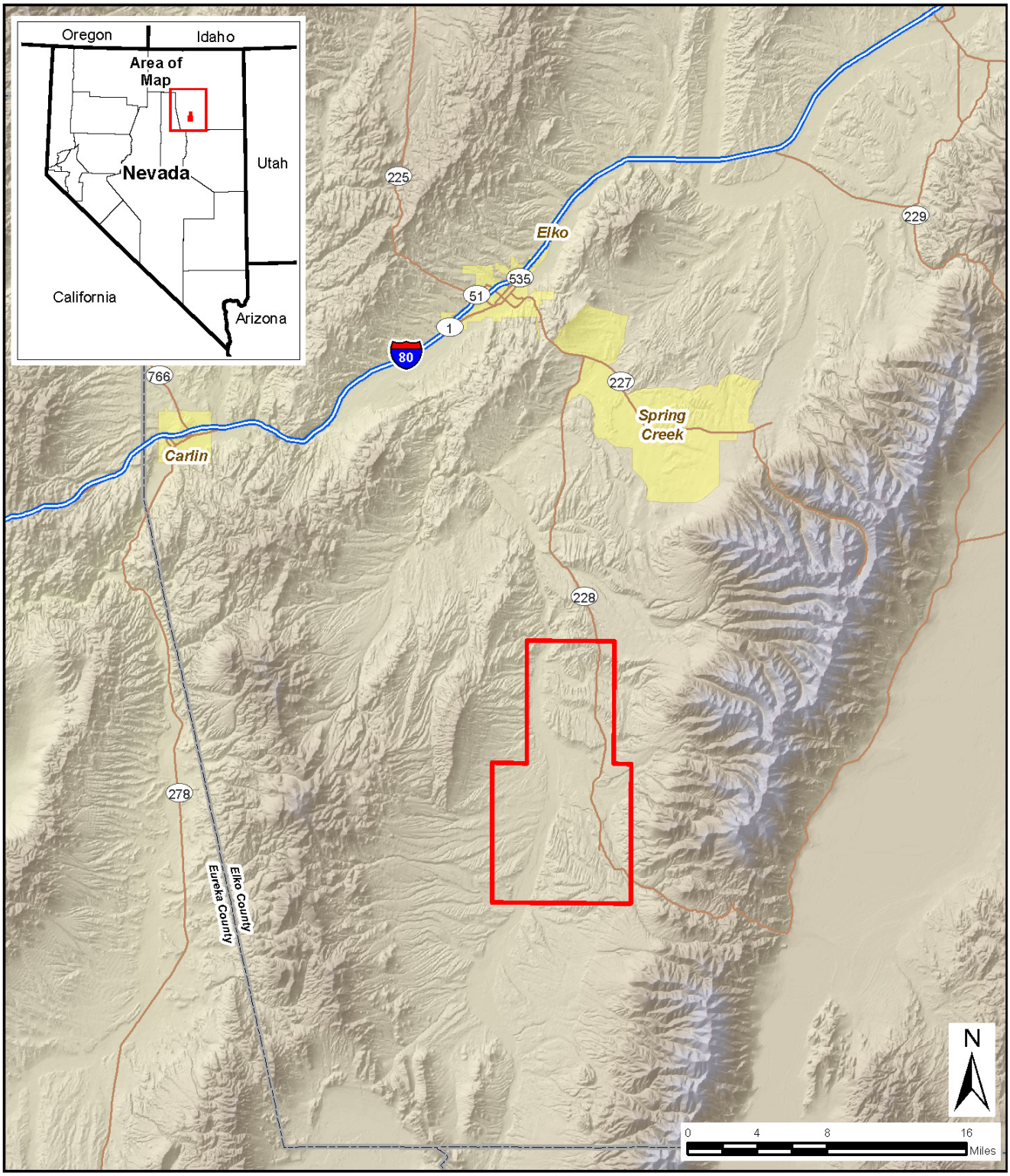
PROJECT NAME: Noble Energy – Huntington Valley Oil and Gas Exploration Project

PLANNING UNIT: Elko District, Tuscarora Field Office

1.1.1 PROJECT LOCATION AND ACCESS

The Project Area is located in Elko County approximately 21 miles south of the City of Elko. General access to the Project Area from Interstate-80 is via U.S. Highway (US) 40 and Nevada State Route (SR) 225 through Elko and south on SR 227 (Lamoille Highway) and SR 228 (Jiggs Highway) (see Map 1.1-1).



Legend

Project Area

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MAP 1.1-1

General Location

Huntington Valley
Oil and Gas Exploration Project

Elko County, NV — May 2014

Three exits from Interstate-80 provide access to the Project Area: Exit 298 west of Elko, Exit 301 in central Elko, and Exit 303 east of Elko. From Exit 298, the access route proceeds approximately 3.7 miles northeast on US 40/Idaho Street to SR 227/South 5th Street. From Exit 301 the access route proceeds approximately 0.9 mile southeast on SR 225 and turns left on US 40 to continue approximately 0.8 mile to SR 227. From Exit 303 the access route travels approximately 4.2 miles southwest on US 40 to SR 227. From the convergence of all three routes at SR 227, the access route continues for approximately 6.9 miles on SR 227 to SR 228. The access route turns right on SR 228 and continues for 17.8 miles to the northern border of the Project Area.

SR 228 is the primary road used for access within the Project Area. All proposed well pads, water well locations, and gravel pits would be accessed using new and existing access roads that connect with SR 228, including Smith Creek Road (Elko County Road [CR] 716A) and Circle L Ranch Road (CR 716). Access to individual well pads and gravel pits from SR 228 is described in the Transportation Plan (Appendix A).

1.1.2 SURFACE AND MINERAL OWNERSHIP

The Huntington Valley Project Area encompasses approximately 63,495 acres. Surface and mineral ownership within the Project Area is shown in Table 1.1-1.

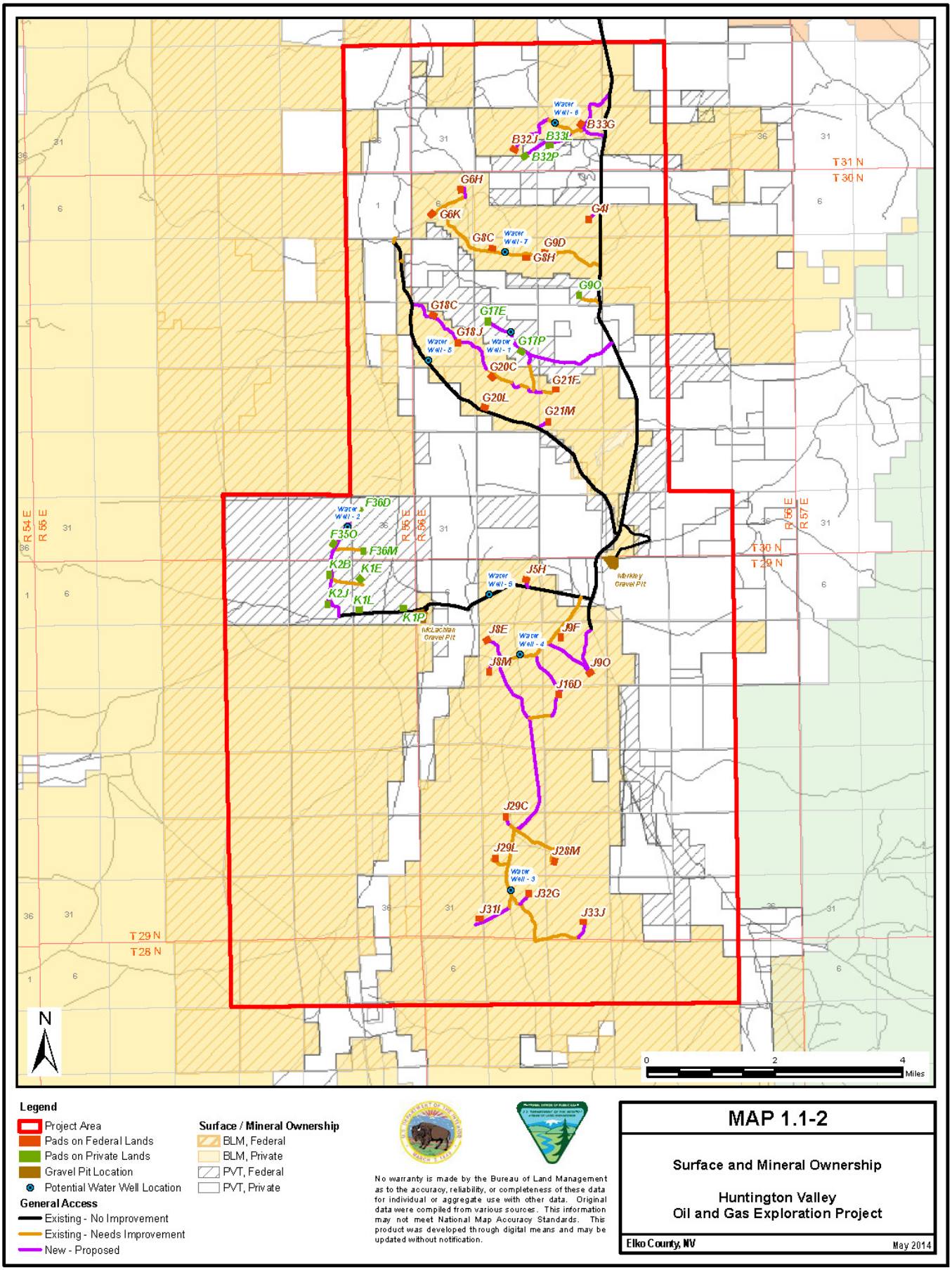
Table 1.1-1
Surface and Mineral Ownership in the Project Area

Surface/Mineral Ownership	Area (acres)	Percent
Federal/Federal	34,758.7	54.7
Federal/Private	188.0	0.3
Private/Federal	8,420.1	13.3
Private/Private	20,128.2	31.7
Total	**63,495.0**	**100.0**

A legal description of the Project Area is provided below (see Map 1.1-2) and a detailed legal description is provided in Appendix B:

Mount Diablo Meridian

Sections 25 and 36, T. 31 N., R. 55 E
Sections 27-34, T 31 N., R. 56 E.
Sections 1, 12-13, 24-25, and 34-36, T. 30 N., R. 55 E.
Sections 3-10, 15-22, 27-35, T. 30 N., R. 56 E.
Sections 1-3, 10-15, 22-27, and 34-36, T. 29 N., R. 55 E.
Sections 2-11, 14-23, and 26-35, T. 29 N. R. 56 E.
Sections 1-3, T. 28 N., R. 55 E.
Sections 2-6, T 28 N., R56 E.



Legend

- Project Area
- Pads on Federal Lands
- Pads on Private Lands
- Gravel Pit Location
- Potential Water Well Location

General Access

- Existing - No Improvement
- Existing - Needs Improvement
- New - Proposed

Surface / Mineral Ownership

- BLM, Federal
- BLM, Private
- PVT, Federal
- PVT, Private

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MAP 1.1-2

Surface and Mineral Ownership

Huntington Valley
Oil and Gas Exploration Project

Elko County, NV — May 2014

1.1.3 NAME AND LOCATION OF PREPARING OFFICE

BLM Tuscarora Field Office, Elko District, Nevada

1.2 PURPOSE AND NEED

The need for the Proposed Action stems from the BLM's legal responsibility to respond to Noble's MSUPO for oil and gas exploration under its mandate to manage public lands according to the Federal Land Policy and Management Act (FLPMA) and the Mineral Leasing Act (MLA), as amended.

The purpose of the Proposed Action is to explore for and develop oil and gas resources within the Project Area.

1.3 PLAN CONFORMANCE REVIEW

The Proposed Action is subject to and has been reviewed for conformance with the following plan (43 Code of Federal Regulations - CFR 1610.5, BLM 1617.3):

The Project is in conformance with the Elko Resource Management Plan (RMP), as approved March 11, 1987 (BLM, 1986a and 1987), and the Programmatic EA for the December 2005 Oil & Gas Lease Sale, which amended the RMP (BLM, 2005). The Record of Decision (ROD) for the Elko Resource Management Plan, page 35, provides, "Maintain public lands open for exploration, development, and production of mineral resources while mitigating conflicts with wildlife, wild horses, recreation, and wilderness resources." In the 1987 ROD for the Elko RMP, page 3, provides that the public lands will be managed under four designations:

1) Limited-subject to no surface occupancy,
2) Limited-subject to seasonal restrictions,
3) Open-subject to standard leasing stipulations, and
4) Closed.

The Project Area is within the area designated as Open-subject to standard leasing stipulations.

The Proposed Action is consistent with other applicable federal, state, and local land use policies and plans. The Proposed Action has been reviewed for conformance with the Nevada and Northeastern California Greater Sage-Grouse Draft Environmental Impact Statement - EIS (BLM, 2013a).

1.4 PUBLIC PARTICIPATION

As part of the National Environmental Policy Act (NEPA) process, a press release outlining the Proposed Action as well as BLM's intent to prepare an Environmental Assessment (EA) analyzing the request was published. The press release, Noble's MSUPO, and a map were posted to the BLM Elko District website at www.blm.gov/rv5c. The BLM sent initial project scoping letters to tribal agencies (Bureau of Indian Affairs) and tribal interest groups (Western Shoshone Committee, Western Shoshone Defense Project, Western Shoshone Descendants of Big Smoky) informing them of the proposed Project and seeking their input, recommendations, and concerns (see Chapter 4). Scoping letters with invitations to initiate government-to-government consultation were sent to 10 tribal and band governments. While none of the contacted tribe or band governments chose to participate in government-to-government level consultation, information sharing during tribal and band council meetings garnered several

comments, concerns, and issues of interest. The BLM invited the public to provide comments on the proposal for 30 days beginning November 13, 2013. The public comment period ended on December 13, 2013. A public meeting was held on December 3, 2013 in Elko, Nevada. Thirty three people signed the public attendance roster.

During the comment period, thirteen comment letters were received: five from state agencies, one from the South Fork Bank Council, two from ranching and industry interests, and five from individuals. Comments received during the public comment period are summarized below and were considered during the impact analysis.

Cultural Resource Concerns

The Nevada State Historic Preservation Office asked why the scoping document doesn't address the National Historic Preservation Act (NHPA) in accord with their interpretation of current BLM policy regarding the combination of NEPA and NHPA public scoping requirements.

One comment noted that the proposed development goes through the Hastings Cutoff, a known historical site.

Native American Concerns

The South Fork Band Council requested that the potential effects and proposed mitigation be implemented to address the following issues:

- Maintaining water quality standards, maintaining integrity of existing groundwater and the groundwater basins (see Section 3.2.4.6, Environmental Effects - Groundwater);
- Quality and ability of the groundwater to recharge the basins and not be diminished by the exploration process (see Section 3.2.4.6, Environmental Effects - Groundwater);
- Independent analysis of water quality as the Project progresses (see Appendix J, Memorandum of Understanding – AQUA Program);
- Cumulative effects of the gas exploration drilling and other ground disturbing activities to the existing groundwater basins (see Section 3.2.4.7, Cumulative Effects);
- Request regulatory oversight (identification of an entity or third party authority) to assure industry standards are met in drilling practices (see Section 2.2.1.1.2, Well Construction, Completion, and On-Site Accommodations).
- Increased road use, road degradation, and resultant road safety (including the foreseeable dusting out of roads negatively impacting the plants, animals, and visibility (see Transportation Plan, Appendix A and Section 3.4.8, Transportation and Access);
- Increased traffic being a hazard to livestock which are the economic base of the South Fork Bank Council (see Section 3.5.1, Livestock Grazing/Rangeland Health);
- Project may affect the Crane Springs Allotment currently leased by the South Fork Livestock Partnership as well as Crane Springs (see Section 3.5.1, Livestock Grazing/Rangeland Health); and
- Project may negatively impact the wilderness area, the Hastings Cutoff, and sage-grouse leks (see Section 3.5.3, Wilderness Study Areas and Land with Wilderness

Characteristics, Section 3.42, National Historic Trails, and Section 3.3.4, Sensitive and Special Status Species).

Tangible and intangible resources (Native American cultural and traditional values), soil, native vegetation species, livestock range, water resources, riparian areas, wildlife, historic and archeological sites are of value and interest to the people of the South Fork Band of the Te-Moak Tribe of the Western Shoshone. The South Fork Bank Council expressed that water is of paramount concern to the people of the South Fork Band. Of stated concern is the integrity of existing groundwater specifically groundwater basins #046 and #047.

Fish and Wildlife
A comment from the Nevada Department of Wildlife (NDOW) expressed concern about mule deer and antelope winter range and habitat and recommended seasonal restrictions on project activities.

General
The Western Energy Alliance expressed support for the Project as an important effort to meet America's demand for oil as well as to provide jobs and economic growth for Nevada. Another general comment asked where the oil and gas will be processed and who will be the end user of the products produced.

Monitoring and Mitigation
One individual commenter asked about monitoring and mitigation for groundwater contamination caused by hydraulic fracturing.

Policy/Process
A commenter suggested holding a second public meeting in Wells.

Range Management
Comments from the South Fork Livestock Partnership addressed grazing management in the area. They expressed concern about degradation of the roads, increased traffic, and dust impacts to cattle and wildlife habitat, and liability for damage to grazing animals and the rangeland. They also expressed concern about Crane Springs and the Crane Springs Allotment currently leased by the South Fork Livestock Partnership.

Special Management Areas
One comment noted that the area considered for this development is on the boundary of a wilderness study area.

Special Status Species
Comments expressed concern that the development will disturb sage-grouse habitat, brood-rearing areas and wintering habitat, and pygmy rabbit burrows. The NDOW requests that the proponent avoid or minimize disturbance to these areas, including the sagebrush community.

Transportation and Access
A commenter expressed concerns regarding the degradation of access roads, traffic congestion on Jiggs highway, increased dust, and the likelihood of collisions with wildlife and range animals. Another comment recommended avoiding the proliferation of new roads.

Visual and Lighting

The Nevada Division of State Lands recommended several lighting and visual mitigation measures that include following "Dark Sky" lighting practices, locating lighting fixtures to avoid light pollution, and using compatible paint colors to reduce visual impacts.

Water Resources

The Nevada Division of Water Resources (NDWR) and Division of State Lands addressed the permit requirements for stormwater, water discharge, diversions, water rights, wells, and water use. The South Fork Band Council expressed concern about water resources, specifically groundwater, and requested an independent analysis of water quality as the Project progresses. One commenter asked about water use for production and water contamination due to hydraulic fracturing.

1.5 DECISIONS TO BE MADE

The BLM's authority for approving oil and gas exploration is listed in 43 CFR 3151. The BLM's approval of oil and gas activities is subject to conditions to prevent undue or unnecessary degradation of public lands and is consistent with the Elko RMP and the Programmatic EA for the December 2005 Oil & Gas Lease Sale (BLM, 2005).

The current EA was prepared in conformance with the policy guidance provided in the BLM's NEPA Handbook H-1790-1 (BLM, 2008). The BLM Handbook provides instructions for compliance with the Council on Environmental Quality (CEQ) regulations for implementing the procedural provisions of NEPA (40 CFR §1500-1508) and the U.S. Department of the Interior (DOI) Manual 516 DM 1-7 on NEPA compliance (DOI, 2005).

The BLM Authorized Officer (AO) will decide, based on the analysis contained in this EA, whether or not to authorize the Proposed Action with Conditions of Approval (COAs). The Decision Record associated with this EA may not constitute the final approval for all actions, such as approval of all individual APDs, Rights-of-Ways, and Sundry Notices associated with the Proposed Action. It does, however, provide the BLM's Authorized Officer (AO) with information upon which to consider approving individual Project components such as APDs, Rights-of-Ways, and Sundry Notices.

1.6 FEDERAL, STATE, AND LOCAL PERMITS OR REQUIRED CONSULTATION

The BLM will consult with the Nevada State Historic Preservation Officer (SHPO) concerning the possible impacts to cultural resources found in the Project Area, the National Park Service (NPS) concerning the possible direct and indirect impacts to the California National Historic Trail – Hastings Cutoff, and with tribes concerning Native American Concerns. Other permits and approvals that may be required for the Project are listed in Table 1.1-2.

Table 1.1-2
Required Permits and Approvals

Permits and Approvals	Agency
BLM Right-of-Way Grant (SF 299 Application)	Bureau of Land Management
Temporary Use of BLM Administered Land	Bureau of Land Management
Use of BLM Administered Land	Bureau of Land Management
BLM Permit to Drill	Bureau of Land Management
Completion Report	Bureau of Land Management
Elko County Road Maintenance Agreement	Elko County Roads Department
Elko County approval for road and bridge use	Elko County Roads Department
Housing Facilities Permit	Nevada Bureau of Health Protection Services, Health Division
Permit to Drill an Oil or Gas Well	Nevada Commission on Mineral Resources, Division of Minerals
Well Completion Report	Nevada Division of Minerals
Oilfield Water Production and Disposal (if a disposal/injection well is drilled)	Nevada Department of Environmental Protection (NDEP)
Air Quality Operating Permit	NDEP Bureau of Air Pollution Control
Surface Area Disturbance Permit	NDEP Bureau of Air Pollution Control
Transient Non-Community Public Drinking Water System Permit	NDEP Bureau of Safe Drinking Water
Permit to install domestic wastewater holding tanks at on-site temporary crew quarters	NDEP Bureau of Water Pollution Control
Over-Dimensional Vehicle Permit	Nevada Department of Transportation
Water Well Drilling Permit Waiver	Nevada Division of Water Resources
Water Use Permit	Nevada State Engineer
Concurrence with BLM determinations of effects for cultural resources	Nevada State Historic Preservation Officer

CHAPTER 2 - PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

The purpose of this chapter is to describe the Proposed Action as well as alternatives, both those analyzed in detail and those considered but not analyzed in detail. Alternatives analyzed in detail include the Proposed Action Alternative, the Well Pad K2J Access Alternative, and a No Action Alternative. Alternatives considered but not analyzed in detail include two alternate access routes to the Merkley Pit 1.

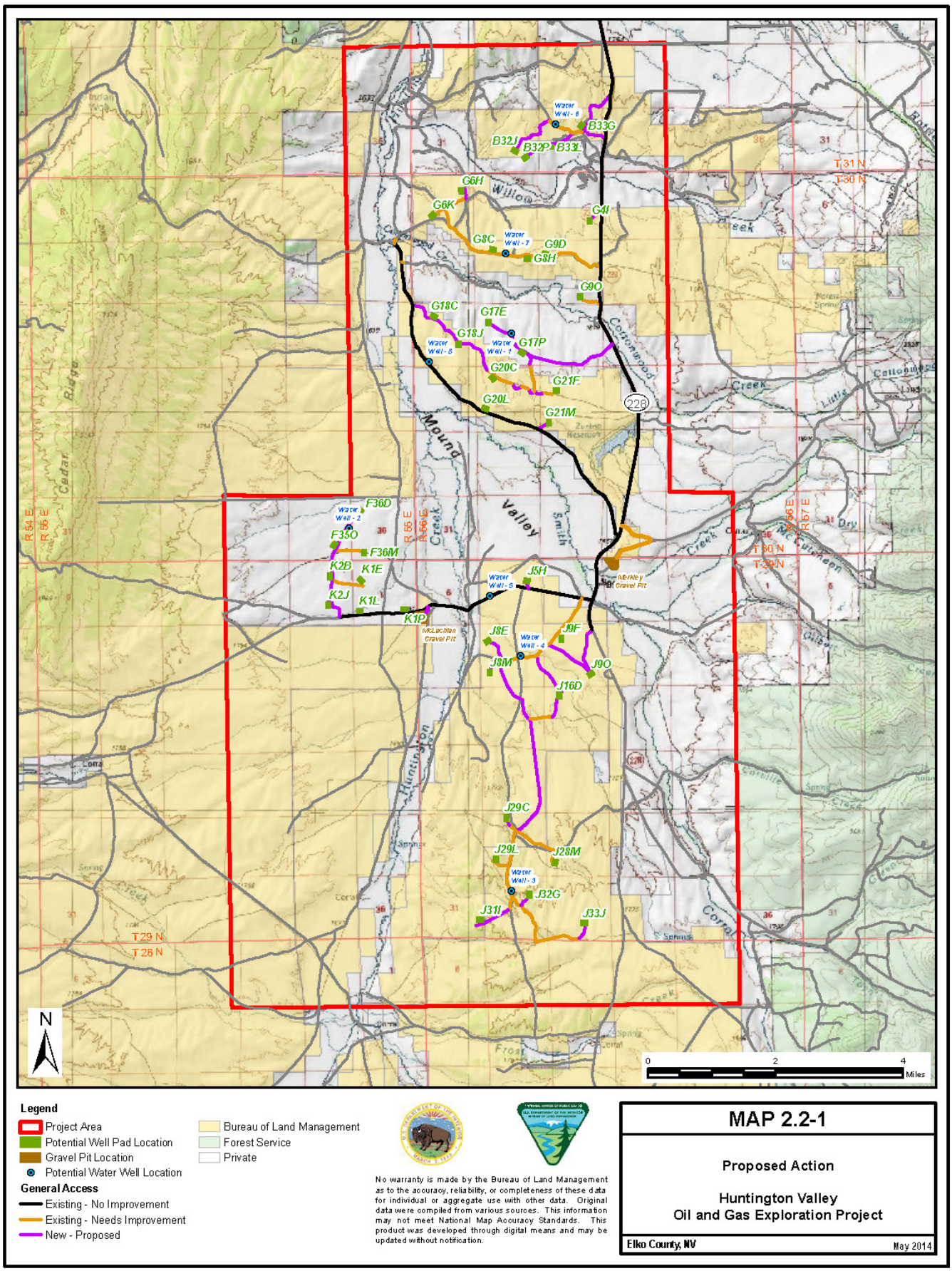
2.2 ALTERNATIVES ANALYZED IN DETAIL

2.2.1 PROPOSED ACTION

Under the Proposed Action, Noble would conduct an oil and gas exploratory drilling program in the Huntington Valley Project Area. The project would include two phases; Construction/Drilling and Production/Operations. The Construction/Drilling Phase includes construction of up to 20 exploration/production well pads and drilling and completion of a maximum of 20 exploration wells, and would take place periodically over 2 years with a maximum of 5 years. The Construction/Drilling Phase also includes new construction and upgrading of local and resource roads. During this phase, Noble could drill a maximum of eight water supply wells on eight water well pads within the Project Area and potentially drill a disposal/injection well. If a disposal/injection well is constructed, it would be drilled on one of the identified 20 exploration/production well pads. Noble would also excavate two gravel pits within the Project Area to provide gravel for well pad and access road construction. All of the surface disturbance associated with the Proposed Action would occur during the Construction/Drilling Phase (see Map 2.2-1). The Construction/Drilling Phase is described in detail below.

If drilling resulted in an unproductive well during the Construction/Drilling Phase, the well would be plugged and abandoned in compliance with the Federal Onshore Oil and Gas Orders and the State of Nevada regulations within 90 days of well completion, weather permitting. If a well produces economic quantities of oil, Noble would produce (operate) the well for an estimated 20 years in the Production/Operations Phase. The two phases can occur simultaneously (i.e., some wells could be producing while others are still being drilled). No additional surface disturbance would occur during the Production/Operations Phase. Details regarding the Production/Operations Phase are provided below.

All phases of the Proposed Action would be in accordance with the Project Design Features and Best Management Practices (BMPs) provided in Noble's MSUPO (Noble, 2014). The MSUPO includes a Transportation Plan (Appendix A to this EA). Also included in the MSUPO are Noble's Fire Prevention Plan Measures, Greater Sage-Grouse BMPs, and a Master Drilling Plan. The Proposed Action would comply with all applicable Federal Onshore Oil and Gas Orders and all other applicable permits and approvals (see Table 1.1-1, above). Noble would be required to adhere to stipulations protecting sensitive resources that are included on federal leases.



Legend

- Project Area
- Potential Well Pad Location
- Gravel Pit Location
- Potential Water Well Location

General Access

- Existing - No Improvement
- Existing - Needs Improvement
- New - Proposed

- Bureau of Land Management
- Forest Service
- Private

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MAP 2.2-1

Proposed Action

Huntington Valley
Oil and Gas Exploration Project

Elko County, NV — May 2014

2.2.1.1 Construction/Drilling Phase

The Construction/Drilling Phase includes constructing well pads, drilling water wells (either on an exploration/production well pad or water well pad), drilling and completing exploration wells, excavating gravel pits, and constructing and upgrading access roads periodically over 2 years with a maximum of 5 years. Noble conducted a 3D Seismic survey in the Huntington Valley Project Area in the fall of 2013. The purpose of the 3D Seismic survey was to allow Noble to select well pad locations. The data from the 3D Seismic survey are currently being analyzed. Noble would use the results of the 3D Seismic Survey, previous 2D Geothermal Seismic programs, and previous well results within the Project Area to select well pad locations that minimize the likelihood of encountering drilling hazards and faults which may act as a conduit for fluids in the reservoir. The seismic data would also be used to select locations that allow for separation of the hydrocarbon bearing zones from any potential water resources of the state.

Noble has identified 39 potential well pad locations; however, no more than 20 of the well pad locations would be constructed under the Proposed Action. Noble submitted three APDs for construction of two well pads during the first year (Well Pad K2J and Well Pad K1L). One well (K2J-1D) would be constructed on the K2J well pad and two wells (K1L-2D and K1L-1V) would be constructed on the K1L well pad. On-site inspections were conducted for both well pads on February 6, 2014. Noble would construct up to 17 well pads and drill up to 17 wells during the second year and beyond. After the first year, up to four of the proposed 17 wells could be horizontal wells depending on the results of other well tests.

Table 2.2-1 provides a list of the 39 potential well pads, their location, and surface and mineral ownership. Table 2.2-2 provides a list of the federal leases held by Noble that could be explored under the Proposed Action, the well pads that would apply to the lease, and a summary of the stipulations for affected leases. Lease stipulations include protections for special status species, wildlife, National Historic Trails, cultural resources and Native American Concerns (see Table 2.2-2). A full listing of the federal lease stipulations is provided in Appendix C.

Table 2.2-1
Potential Well Pad Locations with Surface and Mineral Ownership under the Proposed Action

Well Pad Name	T	R	Sec	Surface Qtr/Qtr	Surface Ownership	Mineral Ownership
B32J	31	56	32	NWSE	Federal	Federal
B32P	31	56	32	SESE	Private	Federal
B33G	31	56	33	SENE	Federal	Federal
B33L	31	56	33	NWSW	Federal	Federal
F35O	30	55	35	SWSE	Private	Federal
F36D	30	55	36	NWNW	Private	Federal
F36M	30	55	36	SWSW	Private	Federal
G17E	30	56	17	SWNW	Private	Federal
G17P	30	56	17	SWSE	Private	Federal
C18C	30	56	18	NENW	Federal	Federal
G18J	30	56	18	NWSE	Federal	Federal
G20C	30	56	20	NENW	Federal	Federal
G20L	30	56	20	NWSW	Federal	Federal
G21F	30	56	21	SENW	Federal	Federal
G21M	30	56	21	SWSW	Federal	Federal
G4I	30	56	4	NESE	Federal	Federal
G6H	30	56	6	SENE	Federal	Federal
G6K	30	56	6	NESW	Federal	Federal
G8C	30	56	8	NENW	Federal	Federal
G8H	30	56	8	SENE	Federal	Federal
G9D	30	56	9	NWNW	Federal	Federal

Well Pad Name	T	R	Sec	Surface Qtr/Qtr	Surface Ownership	Mineral Ownership
G9O	30	56	9	SWSE	Private	Federal
J16D	29	56	16	NWNW	Federal	Federal
J5H	29	56	5	SESE	Federal	Federal
J8E	29	56	8	SWNW	Federal	Federal
J8M	29	56	8	SWSW	Federal	Federal
J9F	29	56	9	NENW	Federal	Federal
J9O	29	56	9	SWSE	Federal	Federal
K1E	29	55	1	SWNW	Private	Federal
K1L	29	55	1	SWSW	Private	Federal
K1P	29	55	1	SESE	Private	Federal
K2B	29	55	2	NWNE	Private	Federal
K2J	29	55	2	NWSE	Private	Federal
J28M	29	56	28	SWSW	Federal	Federal
J29C	29	56	29	NENW	Federal	Federal
J29L	29	56	29	NWSW	Federal	Federal
J31I	29	56	31	NESE	Federal	Federal
J32G	29	56	32	SWNE	Federal	Federal
J33J	29	56	33	NWSE	Federal	Federal

Table 2.2-2
Proposed Well Pads and Lease Stipulations by BLM Lease Number

Federal Lease Number	Effective Lease Date	Well Pad Name	Applicable Lease Stipulations at Well Pad Location
NVN-090953	5-1-2012	B323J B32P	Section 7 Consultation Cultural Resources and Tribal Consultation
NVN-090954	5-1-2012	B33G B33L	Section 7 Consultation Cultural Resources and Tribal Consultation
NVN-79024	10-1-2004	F35O F36D F36M	Native American Consultation Cultural Resources Sage Grouse Strutting Grounds
NVN-090950	5-1-2012	G17E G17P G18C G18J G20C G20L	Section 7 Consultation Cultural Resources and Tribal Consultation Mining Claims and Mill Sites Threatened, Endangered and Sensitive Species Raptor Nesting Site
NVN-081147	3-1-2006	G21F G21M	Threatened, Endangered and Sensitive Species Raptor Nesting Sites Cultural Resources Sage Grouse Strutting Grounds Sage Grouse Brood Rearing Areas Congressionally Designated Historic Trails Material Site
NVN-090948	5-1-2012	G41 G9D G9O	Section 7 Consultation Cultural Resources and Tribal Consultation Mining Claims and Mill Sites Threatened, Endangered and Sensitive Species Raptor Nesting Sites
NVN-090949	5-1-2012	G6H	Section 7 Consultation

Federal Lease Number	Effective Lease Date	Well Pad Name	Applicable Lease Stipulations at Well Pad Location
		G6K	Cultural Resources and Tribal Consultation Mining Claims and Mill Sites Threatened, Endangered and Sensitive Species Raptor Nesting Sites
NVN-090951	5-1-2012	G8C G8H	Section 7 Consultation Cultural Resources and Tribal Consultation Mining Claims and Mill Sites Threatened, Endangered and Sensitive Species Raptor Nesting Sites
NVN-081140	3-1-2006	J28M	Threatened, Endangered and Sensitive Species Raptor Nesting Sites Cultural Resources Congressionally Designated Historic Trails
NVN-081141	3-1-2006	J29C J29L J31I J32G	Threatened, Endangered and Sensitive Species Raptor Nesting Sites Cultural Resources
NVN-081142	3-1-2006	J33J	Threatened, Endangered and Sensitive Species Raptor Nesting Sites Cultural Resources Pronghorn Antelope Kidding Areas Congressionally Designated Historic Trails
NVN-081137	3-1-2006	J8E J8M	Threatened, Endangered and Sensitive Species Raptor Nesting Sites Cultural Resources Pronghorn Antelope Kidding Areas
NVN-081138	3-1-2006	J9F J9O J16D	Threatened, Endangered and Sensitive Species Raptor Nesting Sites Cultural Resources Pronghorn Antelope Kidding Areas Congressionally Designated Historic Trails
NVN-84378	1-1-2008	J17F	No stipulations for this parcel.
NVN-78690	6-1-2004	K1E K1L K1P K2B K2J	Native American Consultation

2.2.1.1.1 Surface Disturbance by Wellfield Component

Table 2.2-3 provides estimates of short-term (less than or equal to 5 years) and long-term disturbance for each project component (see Map 2.2-1). Short-term disturbance includes all disturbances for well pads (production and water well), gravel pits, and access roads which would occur during the Construction/Drilling Phase. Long-term disturbance is that portion of the short-term disturbance remaining during the Production/Operations Phase and would persist for the life of the project, estimated to be 20 years. Short-term disturbance that would be reclaimed

prior to the Production/Operations Phase would include temporary disturbances associated with new road construction, upgrading of existing roads, water well pads, and that portion of the exploration/production well pad utilized for drilling that is no longer needed for Production/Operations. Immediately after construction, temporary road disturbances and a portion of the exploration/production well pad would be reclaimed. The estimates of disturbance in Table 2.2-3 include maximum proposed surface disturbances on BLM-administered lands and on private lands. An estimated 68 percent of all identified disturbance could occur on BLM-administered lands (surface) and 32 percent could occur on private surface. Actual disturbance would be less than the identified disturbance because only 20 of the 39 identified well pad locations would be constructed (see Table 2.2-4).

Table 2.2-3
Identified Potential Short- and Long-Term Surface Disturbances as a Result of Oil and Gas Exploration under the Proposed Action

Component	Potential Length or Number of Sites	Potential Short-Term Surface Disturbance (acres)[1]			Potential Long-Term Surface Disturbance (acres)[1]		
		Federal	Private	Total	Federal	Private	Total
Exploration/Production Well Pads[2,3]	39	156.0	78.0	234.0	91.0	45.5	136.5
Water Well Pad	8	6.0	2.0	8.0	0.0	0.0	0.0
New Resource Roads[4]	7.88 miles	22.5	6.9	29.4	15.2	4.7	19.9
Upgrade Resource Road	5.78 miles	17.2	4.8	22.0	12.8	3.2	16.0
Turnouts[5]	24	0.0	0.0	0.0	3.1	0.3	3.4
Upgrade Local Roads[6,7]	7.35 miles	33.6	1.1	34.7	24.9	0.9	25.8
New Local Roads	9.91 miles	31.1	15.6	46.7	23.1	11.6	34.7
Gravel Pits and Roads[8]	2 pits 1.23 mile	22.9	30.4	53.2	21.9	29.9	51.8
Total		**289.3**	**138.8**	**428.1**	**192.0**	**96.1**	**288.1**

[1] Total acres are taken from GIS disturbance footprint model and are not calculated by multiplying width times length divided by 43,560.

[2] Although only 20 of the 39 potential well pad locations identified by Noble would be constructed, these estimates include all 39 potential pad locations. Twenty-seven of the proposed exploration/production well pads are identified on federal surface with federal minerals and 12 are identified on private surface with federal minerals.

[3] Short-term exploration/production well pad disturbance before interim reclamation is estimated at 6.0 acres per well pad. Long-term disturbance after interim reclamation is estimated at 3.5 acres per production well pad.

[4] Long-term disturbance associated with resource roads assumes a 16 foot travel surface and 5 feet for ditches (2.5 feet on either side of the road), for a total 21 foot travel surface. Short-term disturbance assumes an additional 10 feet of temporary use area.

[5] Short-term disturbance is not shown for turnouts because the disturbance would be within the temporary road disturbance.

[6] Long-term disturbance associated with local roads assumes a 24 foot travel surface and 5 feet for ditches (2.5 feet on either side of the road), for a total 29 foot travel surface. Short-term disturbance assumes an additional 10 feet of temporary use area.

[7] On average, existing roads that require upgrading are 8.6 feet in width. The existing disturbance for all roads requiring upgrading (15.2 acres) is not removed from the estimates of potential disturbance.

[8] Gravel pit disturbance includes 25.0 acres for the McLachlan Pit, 22.3 acres for the Merkley Pit 1, 4.3 acres of long-term disturbance for upgraded and new local roads, and an additional 1.5 acre of short-term road disturbance.

Table 2.2-4
Actual Short-Term and Long-Term Surface Disturbances as a Result of Oil and Gas Exploration under the Proposed Action[1]

Component	Potential Length or Number of Sites	Actual Short-Term Surface Disturbance (acres)[2]	Actual Long-Term Surface Disturbance (acres)[2]
Exploration/Production Well Pads[3]	20	120.0	70.0
Water Well Pads	8	8.0	0.0
Upgrade Resource Roads	5.78 miles	22.0	16.0
New Resource Roads[4]	7.88 miles	29.4	19.9
Turnouts[5]	24	0.0	3.4
Upgrade Local Roads[4,6]	7.35 miles	34.7	25.8
New Local Roads[4]	9.91 miles	46.7	34.7
Gravel Pits and Roads	2 pits, 1.23 mile	53.3	51.8
	Total	**314.1**	**221.6**

[1] Actual estimated short-term and long-term disturbance cannot be divided between federal and private surface/minerals. The 20 selected exploration/production well pads could occur on any combination of lands.
[2] Total acres are taken from GIS disturbance footprint model and are not calculated by multiplying width times length divided by 43,560.
[3] Assumes 3.5 acres of long-term disturbance per production well pad.
[4] Assumes all resource and local road construction and upgrades would be required.
[5] Short-term disturbance is not shown for turnouts because the disturbance would be within the temporary road disturbance.
[6] On average, existing roads requiring upgrades are 8.6 feet in width. The existing disturbance for all roads requiring upgrades (15.2 acres) is not removed from the estimates of potential disturbance.

Exploration/Production Well Pads. Noble has identified 39 potential exploration well pads that may become production well pads; however, only 20 of the 39 exploration/production well pads would be constructed under the Proposed Action. Noble would use the results of the 3D Seismic Program, previous 2D Geothermal Seismic programs, and previous well results from the Project Area to select locations for the 20 exploration/production well pads. Noble estimates that constructing a new single well pad would disturb approximately 6.0 acres per exploration/production well pad. Short-term disturbance for 20 well pads includes cuts and fills, space for stormwater BMPs, possibly a water well and is estimated at 120 acres (see Table 2.2-4 and Figure 2.2-1). The 20 selected exploration/production well pads could occur on any combination of federal or private surface and minerals.

Well pads would be constructed from the native soil and rock materials present in the Project Area using a bulldozer, grader, front-end loader, and/or backhoe. Pads would be constructed by clearing vegetation, stripping and stockpiling all available topsoil, and leveling the pad area using cut-and-fill techniques. The tops of cut banks and pad corners may be rounded to improve their appearance.

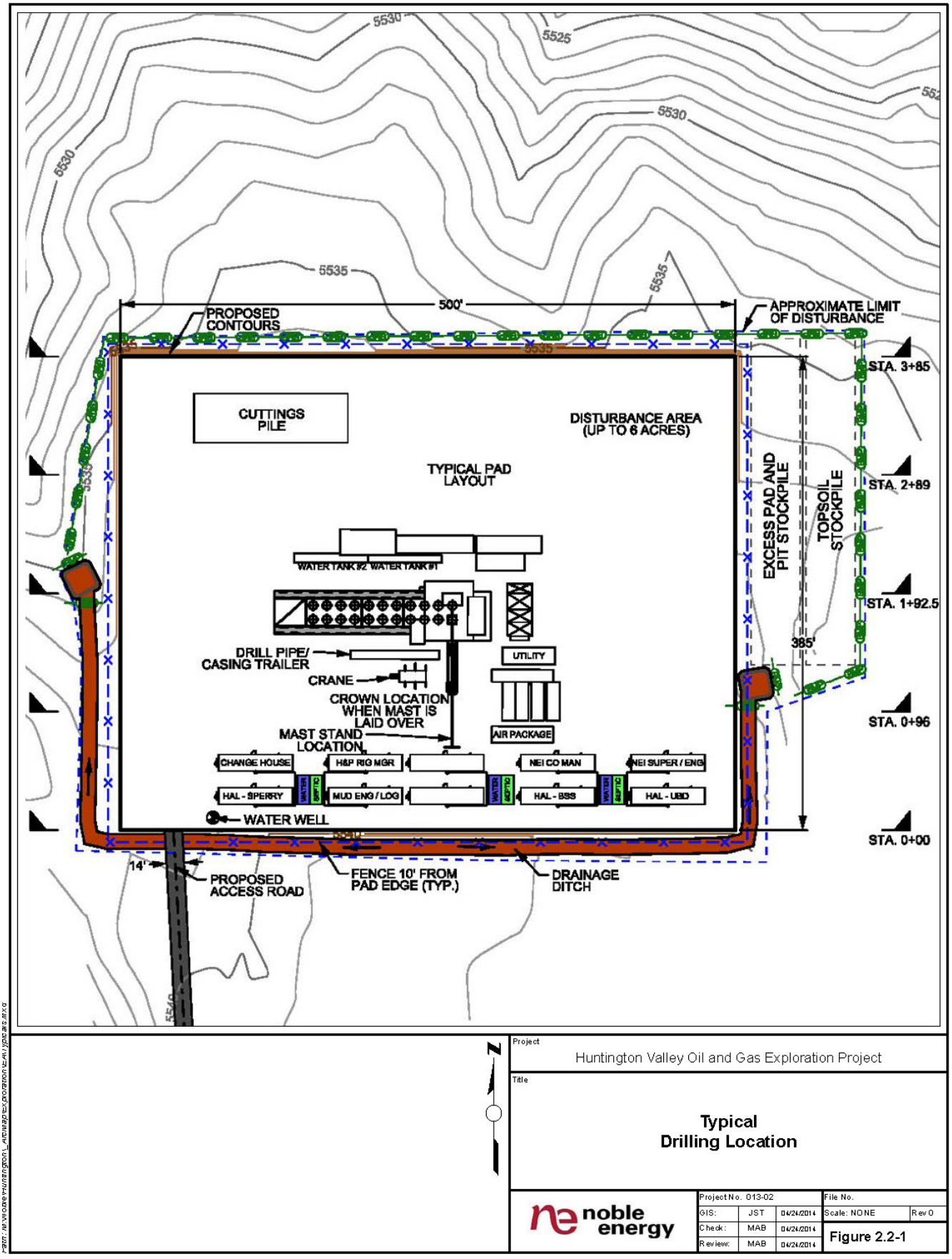
Water Well Pads. Noble has identified eight potential water well pad locations. Noble would attempt to install water wells on the individual exploration/production well pads. If this turns out to not be feasible, the water well pads would be used. It is unlikely that all the water well pads would be used. It is possible that a water well on an exploration/production well pad and a water well on a water well pad could be used at the same time if two exploration wells are being drilled or completed at the same time. Water well locations were chosen based on proximity to exploration/production well pads and generally placed on private lands.

Roads. Noble would use existing highways and county roads to access the Project Area (access routes are described above in Section 1.1.1). The Proposed Action includes construction of new local and resource roads within the Project Area and up to 24 road turnouts. Up to 7.88 miles of new resource roads would generally require a 31-foot disturbance width. Ten feet of this disturbance would be temporary, and final road width would be 21 feet with a 16 foot travel surface (see Figure 2.2-2). Approximately 9.91 miles of new local roads would generally require a 39-foot width for construction. Final road width would be 29 feet with a 24 foot travel surface (see Figure 2.2-3). Upgrading of up to 13.13 miles of existing two-track roads would occur within the existing disturbance as well as outside the existing disturbance. Noble has identified 24 turnout locations where the visible distance on roads would be less than 1,000 feet. The Transportation Plan (Appendix A) provides the construction procedures and measures that Noble would use to upgrade existing roads and construct new roads.

For purposes of analysis, it is assumed that all road construction and upgrading would occur, even though only 20 of the 39 identified exploration/production well pads would be constructed. It is not possible to determine which roads would be constructed and upgraded to access the 20 well pads. Depending on which 20 of the 39 exploration/production well pads are constructed, road construction and upgrading could be less than that estimated for 39 well pads. The exploration/production well pads selected for construction would determine which existing roads would be upgraded and which new roads would be constructed. The Transportation Plan (Appendix A) shows the locations of potential roads that would require upgrading and those that would be constructed to access the well pads.

The roads would be crowned, ditched and graveled, and would be consistent with Gold Book Standards (BLM and U.S. Forest Service – Forest Service, 2007) and BLM Road Manual 9113 (BLM, 2011a). Existing roads would be maintained in conditions equal to or better than conditions that existed prior to commencement of the exploration program. All equipment and vehicles would be confined to the routes shown on Map 2.2-1. Maintenance of the access roads would continue until abandonment and reclamation of the well pads are completed. Road maintenance is described in detail in the Transportation Plan (Appendix A). Roads included in the Proposed Action that are off-lease would require a Right-of-Way Grant from the BLM prior to use.

Gravel Pits. Noble intends to excavate two gravel pits in the Project Area to provide gravel to construct access roads and well pads. The Merkely Pit 1, located south of Smith Creek Road east of SR 228, would include approximately 22.3 acres. The McLachlan Pit, located south of Circle L Ranch Road west of SR 228, would include approximately 25 acres. For access to the Merkley Pit 1, 1.14 mile of existing road would be upgraded to a local road both within and outside the existing disturbance. Approximately 0.1 mile of new local road would be required for the McLachlan Pit. The use of gravel for construction would conform with BLM requirements and would be inspected and approved by the Nevada Department of Agriculture (NDOA). Gravel pit locations are shown on Map 2.2-1.

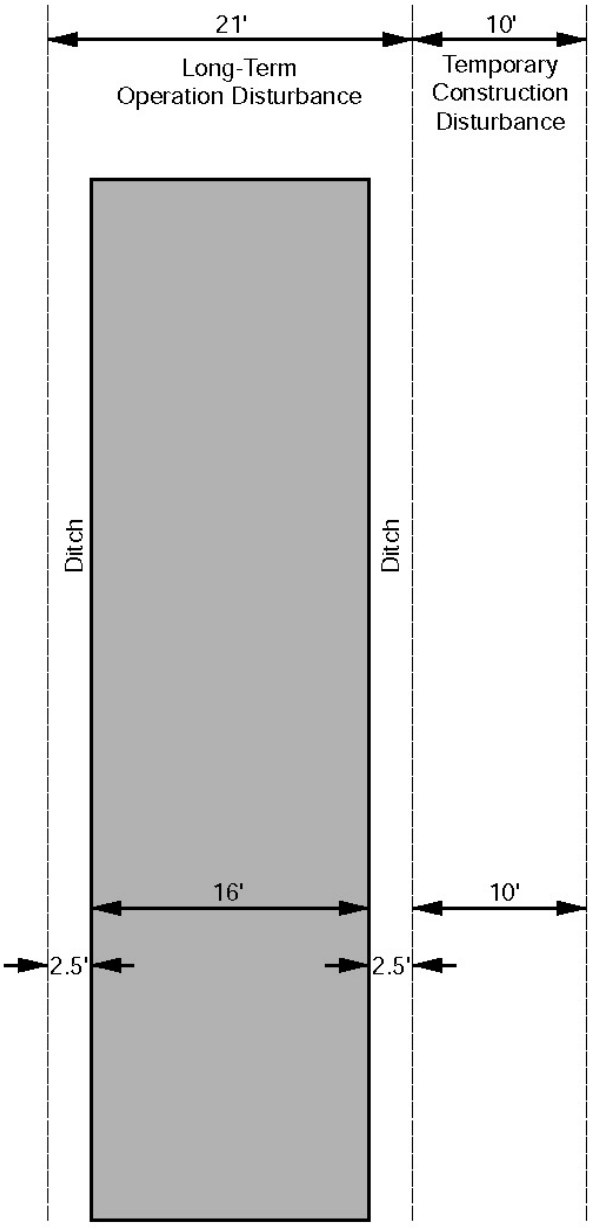


Project: Huntington Valley Oil and Gas Exploration Project

Title: Typical Drilling Location

noble energy

Project No. 013-02			File No.	
GIS:	JST	04/24/2014	Scale: NONE	Rev 0
Check:	MAB	04/24/2014	Figure 2.2-1	
Review:	MAB	04/24/2014		

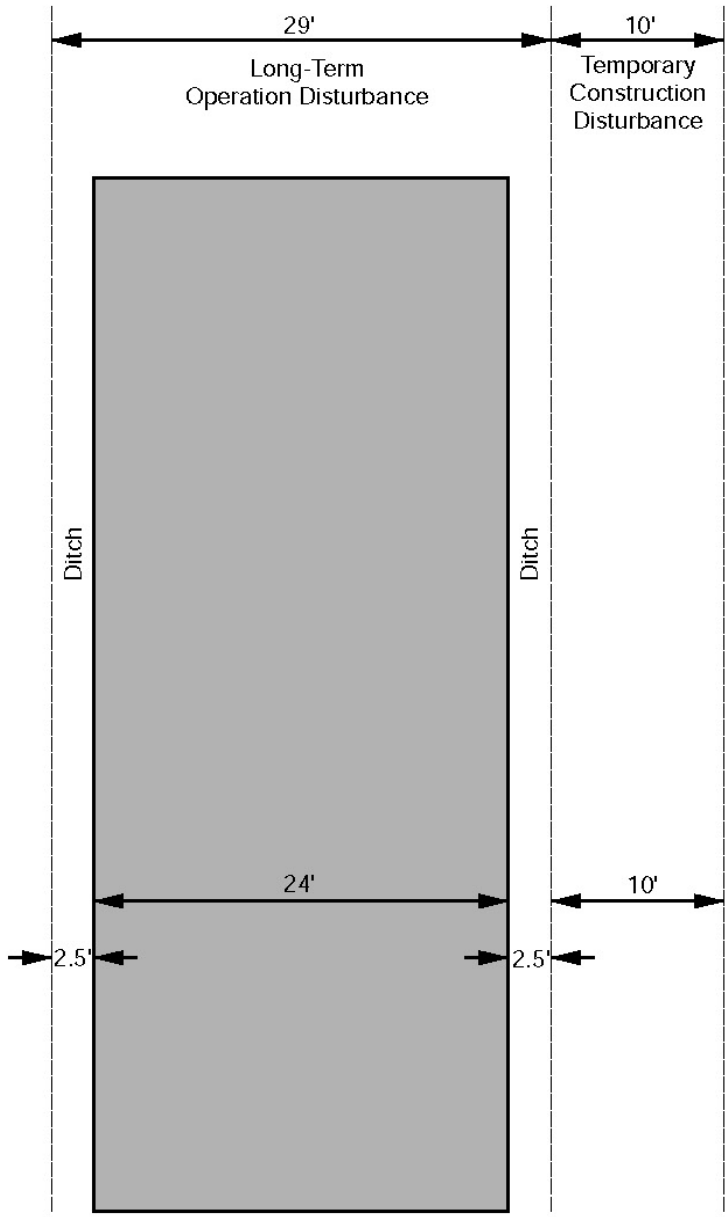


Project
Huntington Valley Oil and Gas Exploration Project

Title
Resource Road
Disturbance Footprint

noble energy

Project No. 013-02			File No.	
GIS:	JST	04/24/2014	Scale: NONE	Rev 0
Check:	MAB	04/24/2014	Figure 2.2-2	
Review:	MAB	04/24/2014		



Project
Huntington Valley Oil and Gas Exploration Project

Title
Local/Collector Road
Disturbance Footprint

noble energy

Project No. 013-02			File No.	
GIS:	JST	04/24/2014	Scale: NONE	Rev 0
Check:	MAB	04/24/2014	Figure 2.2-3	
Review:	MAB	04/24/2014		

2.2.1.1.2 Well Construction, Completion, and On-Site Accommodations

Well construction includes several activities, starting with well drilling, casing, and testing (evaluation of drill cutting, geophysical logging, and/or drill stem testing). If economic resources are identified, the wells would be completed by additional testing, to ensure casing strength, casing perforation and, if necessary, well stimulation (by hydraulic fracturing).

Well Construction

The Humboldt, Indian Well, and Elko formations would be targeted during drilling. The target zone for the wells is a true vertical depth of between 7,000 and 13,000 feet. Targets for possible horizontal wells would be determined by the results of the vertical and directional wells. The length of the horizontal sections (if drilled) is not known, but generally, horizontal sections would not exceed 9,000 feet in length. Fewer wells may be drilled during exploration than are proposed depending on well test results and geologic and market uncertainties.

Drilling would be conducted in compliance with all Federal Oil and Gas Onshore Orders, as well as all other federal, state, and local rules and regulations. The Nevada Division of Minerals (NDOM) oversees permitting and regulation of the oil and gas industry in the state. NDOM oversees wells drilled on state and private lands, and the BLM permits wells on federal lands. The BLM and NDOM coordinate efforts. Noble anticipates that one drilling rig and one completion team would be required during the first year and possibly two drilling rigs and one completion team could be required during the second year and beyond.

Any usable water zones encountered during drilling would be adequately protected in accordance with the Federal Onshore Oil and Gas Orders and the 43 CFR 3100 regulations by installing surface or intermediate casing as approved by the BLM AO and reported. All usable water zones, potentially productive hydrocarbon zones, and valuable mineral zones would be isolated by cementing the open space between the casing and the bedrock.

Noble would use a closed-loop drilling system which eliminates the requirement for reserve pits. Without a closed loop system, drilling fluids (mud, water, additives) are circulated through the wellbore and subsequently deposited, along with drill cuttings, in a reserve pit dug near the well to hold non-toxic used drilling fluids and cuttings. In a closed-loop system, the pit is replaced with a series of storage tanks that separate liquids and solids. This equipment minimizes the amount of drilling waste muds and cuttings that require disposal and maximizes the amount of drilling fluids that are recycled and reused in the drilling process.

Drilling would be performed with circulation of an inert bentonite water-based mud, with various viscosity and density-adjusters such as polymers and barite. Density is adjusted to lift cuttings and suppress formation fluid pressure. Other additives may be used to stabilize borehole wall expansive clays. Drilling mud lubricates and cools the bit and flushes cuttings to settling tanks at the surface. Drilling mud would be displaced from the well bore in each separate casing setting and cementing event (surface, intermediate, and production casings). Cuttings would be buried on-site after testing (i.e., land farmed) – see Section 3.4.9 below for information on testing. It is not anticipated that soil would be imported to cover the cuttings.

Two steel casings would be installed in every borehole, and three steel casings in boreholes which are fully completed and tested. The surface hole would be cased with steel casing and cemented in place entirely from ground level to the depth as determined in the individual APD (to a depth to isolate upper aquifers). The surface casing would be set in bedrock and cemented with sufficient cement to fill the outer casing (annular) space, and set to a minimum depth of 500

feet (based on NDOM requirements) to protect freshwater aquifers. This is below the deepest permitted water well in the Project Area which is 370 feet. Prior to drilling below the surface casing, Blowout Preventer Equipment (BOPE) would be welded to the top of the surface casing to contain unexpected fluid blowouts. Both the BOPE and the surface casing would be tested for pressure integrity. The BOPE and related equipment would meet the minimum requirements of Federal Onshore Oil and Gas Order No. 2, and the BLM AO would be notified in advance to witness all pressure tests.

During continued drilling, intermediate casing would be set to protect oil, gas, usable quality water zones (if encountered) and prospectively valuable minerals deposits; to provide protection against abnormal pressure zones and lost circulation zones; or when otherwise required by anticipated well conditions. The casing string would be cemented with a sufficient volume of cement to cover and/or isolate all hydrocarbon zones or other mineral deposits, isolate abnormal pressure intervals from normal pressure intervals, and contain any fluids with the potential to migrate and/or isolate formation fluids.

After drilling the hole to its final depth, logging tools would be run into the well to evaluate the potential hydrocarbon resource. If the evaluation indicated that adequate hydrocarbon resources were present and recoverable, steel production casing would be run and cemented into place in accordance with the well design, as approved by the BLM. The proposed casing and cementing program would be designed to protect and/or isolate all usable water zones, potentially productive zones, lost circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals. BLM approval would be required prior to the use of any isolating medium other than cement.

Lighting during construction would follow “dark sky” lighting practices. Such practices are designed to reduce the effects of artificial light on the natural environment, including sky glow, glare, light trespass, light clutter, and decreased visibility at night (International Dark-Sky Association – IDA, 2014). “Dark-sky” lighting practices implemented in the Project Area would include, but not be limited to the following:

- using low glare lighting equipment;
- shielding security lighting so that the majority of light hits the target and does not cause glare;
- targeting lower lighting levels and better uniformity for safety and security lighting; and
- to the extent practical, aiming lighting on facilities from the top down, and away from adjacent areas.

Well Completion

After production casing has been cemented in place, the drilling rig would be removed and a completion rig would be moved in. Well completion would consist of running a cement bond log to evaluate cement integrity and correlate the cased hole logs to the open hole logs. The casing would sealed be off in stages and then perforated across the hydrocarbon producing zones and swabbed. The formation is tight and could be stimulated to enhance the production of oil and gas. The typical method used for stimulation consists of a hydraulic fracture treatment in which sand and non-toxic fluids are pumped into the producing formation with sufficient pressure to create small fractures in the rock formation that form pathways for hydrocarbons to flow into the well. Hydraulic fracturing is further described in Appendix D. Sand serves as a proppant to keep the tiny fractures open. Completions are expected to take between 5 and 21 days for both

vertical/directional wells and horizontal wells. Hydraulic fracturing is part of the proposed completion process and is expected to take an additional 3 to 5 days per well.

Completion fluids are custom-engineered to accomplish various objectives, including:

- Pressuring the formation through perforations in the production casing to fracture the rock, and propagate those fractures some distance into the formation;
- Carrying proppant particulates, sand, ceramic or plastic (to prop fractures open when the pressure is released), and small rubber balls to block perforations and hold injected fluids outside the casing for a short time; and
- Carrying other chemicals to "break" the gel suspending the proppant, disinfect the hydraulically fractured zone and retard microbial growth which can sour the well, and flush general residual chemicals.

Table 2.2-5 provides a tentative list of materials that may be used as completion fluid additives. Note that the list of materials does not contain diesel, which was common in fracturing fluids 10 years ago. The only constituent not fully disclosed is a proprietary amine polymer formulation ("KCl substitute") which is added in small quantities to augment clay stabilization. Most constituents are either consumed in the treatment (acid, pH buffers), inert (sand), or are biodegradable. Biocide retards microbes that would otherwise grow rapidly in the guar starch, until such time as the fluid can be produced in flowback water or displaced and plugged in a well that is abandoned.

Lithium bromide or other tracer would be added to injected water and may be used to affirm casing integrity and locate fracture paths. It exists in solution as ions which are not readily adsorbed to solids or reacting with outer solutes, and would migrate at the same rate as the carrying fluid. Lithium bromide is included in the sampling parameter list in the Aqua Program (see Appendix J) because it can function as an identifying signature in the event the fluid is suspected to have reached a well or spring.

The radioactive tracer, if used, would be a low-level radioactive additive which requires operator training but no special handling measures, and can be detected outside the casing by sensitive logging tools. These substances are either recovered in flowback water which is disposed of responsibly, or may remain sealed in the subsurface if the well is plugged. Some radioactive tracers are inserted in ceramic proppant so that they can indicate fracture strength, and some may be alloyed into casing collars to identify them in logs. All radioactive tracer material use is strictly regulated by the Nuclear Regulatory Commission (NRC) and the U.S. Environmental Protection Agency (EPA), in terms of storage, handling, and disposal.

Subsequent to drilling and completion of any well, it is shut in under pressure, and that pressure is monitored to assess formation pressures and the possibility of leaks, prior to final development.

Table 2.2-5
Tentative List of Materials for Hydraulic Fracturing

Material	Volume	Description	Purpose	Fate
Option #1: Cross-Linked Gel Sand Fracturing for Vertical Wells: 5 Stages of 150,000 lbs.				
Water	425,000 gal.	Fresh Water	Fluid basis	Flowback
Sand	35,000 lbs.	100 mesh	Very fine proppant	Inert
Sand	750,000 lbs.	Premium White Sand	Proppant	Inert
Labeled ceramic		Radioactive tracer	Ceramic proppant with trace radioactivity	Low radioactivity
LGC	5 gal/1000g	Liquid Gel Concentrate	Guar (legume) starch	Biodegradable
Breaker	2.5 gal/1000g	Gel Breaker	Encapsulated ammonium persulfate oxidizer	Chemically degradable
HCl	1000 gal.	15% Hydrochloric Acid	Muriatic acid, cleaner and breaker	Neutralized by rock
Corrosion inhibitor	0.5 gal/1000g	In acid solution only	Retards acid attack on steel	Adheres to steel
Citric Acid	50 lbs/1000g	In acid solution only	Sequesters dissolved iron and prevents rust coat	Biodegradable
Ball Sealers	1000 ea.	5/8" diameter rubber balls	After fracturing, plug perfs and hold well pressure	Inert
KCl	2% in Water	Potassium Chloride	Formation clay stabilizer	Adsorbed to borehole wall clay
"KCl Substitute"	1 gal/1000g	Proprietary polymer	Clay stabilizer	Biodegradable, and adsorbed
Biocide	0.2 gal/1000g	Dibutyl normal propanamine	Disinfectant	Biodegradable
Cross Linker	2.25 gal/1000g	Borate X-linker with caustic	Forms gel in guar starch	Disperses at neutral pH
Buffer	0.5 gal/1000g	Formic Acid	Weak acid, pH regulator	Biodegradable
Non-emulsifier	1.0 gal/1000g		Soap	Flowback
Option #2: Large Acid Job for Vertical Wells: Single Stage with Diversion				
Water	13,000 gal.	Fresh Water	Fluid basis	Flowback
HCl	100,000 gal.	15% Hydrochloric Acid	Muriatic acid, cleaner and breaker	Neutralized by rock
Ball Sealers	1000 ea.	5/8" diam. RCN Ball Sealers	After fracturing, plug perfs and hold well pressure	Inert
Citric Acid	50 lbs/1000g	Iron Sequestrant	Sequesters dissolved iron and prevents rust coat	Biodegradable
Surfactant	2 gal/1000g	Friction Reducer		
Demulsifier	1.0 gal/1000g			
Biocide	0.2 gal/1000g	Dibutyl normal propanamine	Disinfectant	Biodegradable
Corrosion inhibitor	0.5 gal/1000g	In acid solution only	Retards acid attack on steel	Adheres to steel
KCl	2% in Water	Potassium Chloride	Formation clay stabilizer	Adsorbed to barehole wall clay
Option #3*: Cross-Linked Gel Sand Fracturing for Directional Wells: Ten Stages of 150,000 lbs. (Double all volumes of Option #1) (Large Acid Job Option not recommended for directional wells) *May be used later in exploration.				

On-Site Accommodations

Noble would provide on-site accommodations for drilling workers. On-site accommodations at the pad location would include ten self-contained mobile modular buildings that require no foundation or construction, and would provide temporary housing quarters for up to 30 drilling workers (see Figure 3 in Appendix E). The on-site accommodations would require no water withdrawal from or discharge into the Project Area. Noble would obtain a permit from the Nevada Division of Environmental Protection (NDEP) Bureau of Safe Drinking Water to operate a public water system, to include five booster pump stations, three 3,135 gallon storage tanks

and a distribution system, for the on-site accommodations. Noble would also obtain a permit from the NDEP Bureau of Water Pollution Control to install three 4,000 gallon domestic wastewater holding tanks. The water systems would provide water for showers, laundry, inside toilets, laboratories, and cooking. Noble would contract with an approved water hauler in the State of Nevada to haul potable water to the storage tanks on the well site and haul wastewater from the well pad locations to an approved disposal facility. Drinking water would be brought to the site in 5 gallon containers.

The modular buildings would be located directly on the well pad where a well was being drilled and would be removed once drilling was completed (after an estimated 50 to 65 day drilling period). Each drill crew would occupy the on-site unit for approximately 14 days and drilling workers would not be allowed to leave the Project Area while staying in the on-site accommodations. On-site accommodations would not be provided for completion workers.

Noble anticipates that one drill rig would be required the first year and that two rigs may be used in the second and any subsequent years. Accordingly, on-site housing occupancy would peak in the second year, with 60 drilling workers staying in modular units placed on two well pad locations. Noble and its drilling contractor would educate drill crew workers about the importance of avoiding wildlife harassment and habitat destruction; instruct drilling workers not to collect or disturb any cultural resources; and enforce the requirement that drilling workers remain on-site throughout their contracted employment period. Peak traffic estimates would include up to 60 additional light vehicles per day if on-site housing were not used. Noble would obtain all appropriate permits from the BLM and the State of Nevada for the on-site accommodations.

2.2.1.1.3 Water Requirements and Water Supply

During the Construction/Drilling Phase, water would be required for drilling, well completion (includes hydraulic fracturing), and dust control. Water volumes required for drilling a vertical/directional well would depend on the depth of the well. Anticipated water use for drilling a vertical/directional well is approximately 10,000 barrels (420,000 gallons). The volume of water required to drill a horizontal well is expected to approximate 30,000 barrels (1.26 million gallons), and would depend on the depth of the vertical portion of the well and the length of the horizontal section. If 16 of the 20 proposed wells are vertical/directional wells and four are horizontal wells, total water required for drilling could be up to 280,000 barrels (11.76 million gallons or 36.1 acre-feet).

Well completion (flushing and hydraulic fracturing), which establishes the flow path between the reservoir and the surface, is expected to require 20,000 barrels (840,000 gallons) for a single vertical/directional well and 200,000 barrels (8.4 million gallons) for a single horizontal well. Based on knowledge gained from two wells drilled on private lands in Elko County and during the first year of construction, Noble anticipates decreasing the water required to complete a vertical/directional well to 13,000 barrels with a goal of 6,000 barrels per well. If 16 of the 20 proposed wells are vertical/directional wells and four are horizontal wells, total water required for completion could include up to 1,120,000 barrels (47.04 million gallons or 144.4 acre-feet). Table 2.2-6 summarizes the estimated water requirements for drilling and completion of a single well.

Table 2.2-6
Estimated Water Required to Drill and Complete a Single Well

Well Type	Drilling		Completion	
	(Barrels)	(Gallons)	(Barrels)	(Gallons)
Vertical/Directional Well	10,000	420,000	20,000	840,000
Horizontal Well	30,000	1,260,000	200,000	8,400,000

Dust control on roads and construction areas during the Construction/Drilling Phase would require an estimated 835 barrels (35,058 gallons) of water per day in the first year of exploration and 3,339 barrels (140,233 gallons) of water per day in the second year. Areas proposed for disturbance would be watered on a regular basis, and water sprays would be applied to material storage pits on a regular basis. The volume of water required for dust control would be lower if Noble used other methods to control dust, such as:

- Graveling roadways, storage areas, and staging areas;
- Following posted speed limits and not exceeding 20 miles per hour (mph) where not posted;
- Halting construction when high winds inhibit dust control;
- Using other dust suppressants, such as DirtGlue, magnesium chloride, and tree sap; and/or
- Re-vegetating reclaimed areas.

Water use at on-site accommodations would approximate 36 barrels (1,512 gallons) per day during the first year and 72 barrels (3,024 gallons) per day during the second year (Noble, 2014). Table 2.2-7 summarizes the Proposed Action's estimated water requirements during the anticipated two years of project construction. Approximately 227,309 barrels (9.5 million gallons) are expected to be required during the first year of construction, and approximately 1,706,737 barrels (71.7 million gallons) are expected to be required during the second year.

Table 2.2-7
Estimated Annual Water Requirements during Construction

Year and Project Activity	Water Required	
	(Barrels)	(Gallons)
Year 1		
Drilling[1]	40,000	1,680,000
Completions[1]	80,000	3,360,000
Dust Control[2]	100,166	4,206,989
On-Site Worker Housing[3]	7,143	300,006
Total Water Use – Year 1	**227,309**	**9,546,995**
Year 2		
Drilling[4]	240,000	10,080,000
Completions[4]	1,040,000	43,680,000
Dust Control[5]	400,666	16,827,955
On-Site Worker Housing[6]	26,071	1,094,982
Total Water Use – Year 2	**1,706,737**	**71,682,937**

[1] Based on four vertical/directional wells drilled and completed in Year 1.
[2] Based on 80 barrels of water per mile applied to 10 miles of unpaved roads (miles associated with construction of 4 pads) for 120 days.
[3] Based on 35.7 barrels of water per day consumed at one drilling location for 200 days.
[4] Based on 16 vertical/directional wells and four horizontal wells drilled and completed in Year 2.
[5] Based on 80 barrels of water per mile applied to 42 miles of unpaved roads (miles associated with construction of 16 pads) for 120 days.
[6] Based on 71.4 barrels of water per day consumed at two drilling locations for 365 days.

Noble expects that on-site water wells drilled at exploration/production pad locations would provide 100 percent of the water required for drilling, completion, and dust control. In the event that water wells are not drilled at pad locations, Noble has also identified eight locations along local and resource roads in the Project Area as potential water well sites (see Map 2.2-1). These wells would provide water for drilling, completion, and dust control. The number and location of the centrally-located water wells would depend on the location of the exploration/production well pads selected for construction and whether the constructed well pad included a water well. Water wells located along access roads would be drilled to an approximate depth of 500 feet and would require an estimated 1.0 acre of disturbance. Water wells would remain open until Noble determined that no additional oil wells would be drilled in the vicinity. Water would be transferred from water wells to well pads by tanker truck or through temporarily-installed flexible fiber water lines that would run along roadway ditches between water wells and the water storage tank on the drilling well pad.

Water supply wells on private land could be used by the landowner during Noble's activities and turned over to the landowner for agricultural use upon cessation of Noble's activities. Noble would develop surface water and groundwater supplies in compliance with applicable laws and groundwater permitting requirements. All water uses would be permitted through the NDEP and/or the NDWR, as appropriate.

Noble expects that off-site water sources (Spring Creek Utilities) may be used as a backup water supply if necessary. All of the water required by on-site accommodations for drilling workers would be from off-site sources (City of Elko). After the first year of drilling, water could also be obtained by temporary conversion of agricultural water in compliance with applicable federal and state law. Water would be transported from off-site sources by tanker truck over existing roads. Traffic associated with water supply and delivery is described in the Transportation Plan (Appendix A). For purposes of estimating traffic and workforce, it is assumed that the backup water supply would provide 30 percent of the water for drilling, completion, and dust control. Overall, with this assumption, off-site water sources would provide 68,193 barrels (2.9 million gallons) during the first year of construction and 512,021 barrels (21.5 million gallons) during the second year.

2.2.1.1.4 Workforce

Table 2.2-8 shows peak construction workforce estimates for the Proposed Action. The construction workforce would peak at 142 workers during the second year and would occur with two drill rigs and one completion team located at different well pads. During the first year, when one drilling rig and one completion rig would be in operation, the construction workforce would include approximately 105 workers. Drilling rigs would operate 24 hours per day, 7 days per week, and well completion crews would work during daylight hours, 7 days per week.

Noble expects that drilling and well completion crews would consist of non-local workers and that other construction workers would be likely to reside in the local area. Noble expects that approximately 10 percent of the construction workforce (21 workers) could be local and 90 percent (110 workers) non-local.

Table 2.2-8
Estimated Peak Construction Workforce

Workforce Category	Peak Number of Workers
Well Pad and Road Construction[1]	17
Water Wells	4
Drilling[2]	60
Completion[3]	50
Water Truck Drivers[4]	7
Dust Control[5]	2
Interim Reclamation	2
Total Peak Construction Workforce	**142**

[1] Includes six construction workers and 11 gravel truck drivers.
[2] Assumes two drill rigs in operation with two eight-man drilling crews per rig. Drilling crews would work alternate 12 hour shifts. Additional drilling personnel include site managers and well site consultants, mudloggers, mud engineers, solids control, directional driller, measurement while drilling (MWD), and active system aeration workers.
[3] Assumes one completion rig in operation and 50 workers during hydraulic fracturing.
[4] Assumes that 30 percent of the water used for drilling and completion is delivered in 120 barrel trucks, and that 2 hours are required to complete a round-trip for trucks hauling water to the Project Area.
[5] Assumes 80 barrels (3,360 gallons) of water per mile are sprayed from 100 barrel (4,200 gallon) capacity trucks.

2.2.1.1.5 Traffic

Noble proposes to use one drill rig in the first year of project construction. Noble expects that on-site water wells would provide 100 percent of the water required for drilling and completions, which would limit the traffic associated with well construction (drilling and completion activities). This analysis assumes, for greatest impact scenario, up to 30 percent of the water could be obtained from off-site sources (Spring Creek Utilities). On-site water wells, on-site accommodations, and requiring drilling workers to remain on-site while the well is being drilled would limit traffic associated with drilling a single well to approximately six vehicles per day. Typical traffic levels during the first year would occur with one vertical/directional well being drilled, one vertical/directional well being completed, deliveries, and dust control. At these times, typical project-related traffic would include 26 light vehicle and 20 heavy vehicle round-trips, for a total of 46 round-trips per day. Noble anticipates using two drill rigs during the second and any subsequent years of construction. With two drill rigs drilling two vertical/directional wells, typical traffic levels in the Project Area would potentially include 30 light vehicle and 22 heavy vehicle round-trips, for a total of 52 round-trips per day (see Table 2.2-9).

On the days drill crews rotate (every 14 days), there could be up to 30 additional light vehicle round-trips per drill site. Additional traffic would also occur during periods of rig mobilization, which includes moving the modular structures sited on the well pad. Noble expects that rig mobilization would require 5 days for rig set-up and 5 days for rig take-down. During these 10 days, additional traffic in the Project Area would include 9 light vehicles and 15 heavy vehicles (75 trucks over 5 days).

Table 2.2-9
Estimated Typical Construction/Drilling Traffic in Vehicle Round Trips per Day

Activity	Duration (days)	Peak Vehicle Round-Trips per Day		
		Light Vehicles	Heavy Vehicles	Total Vehicles
Drilling	50	4[1]	2[2]	6
Completion and Flowback	21	12[3]	17[4]	29
Service and Deliveries	71	10[5]	0	10
Dust Control	71	0	1[6]	1
Total Typical Construction Traffic – Year 1[7,8]		**26**	**20**	**46**
Total Typical Construction Traffic – Year 2[7,9]		**30**	**22**	**52**

[1] Assumes that all drilling workers are housed in on-site temporary crew quarters and remain on-site for 14 days. Light vehicles include four miscellaneous personal vehicles.
[2] Assumes that 30 percent of the water required to drill a vertical/directional well (3,000 barrels) is delivered in 120 barrel capacity trucks over 50 days. Includes one additional truck per day delivering supplies (e.g. casing deliveries, cement trucks, wireline logging trucks).
[3] Includes six personal vehicles for 18 workers and two supervisor vehicles. Assumes that completion workers carpool in 10 light vehicles. Includes two supervisor vehicles.
[4] Assumes that 30 percent of the water required to complete a vertical/directional well (6,000 barrels) is delivered in 120 barrel capacity trucks over 21 days. Includes 15 trucks delivering equipment, supplies and materials for well completion.
[5] Includes vendor deliveries and service visits.
[6] Assumes that 100 barrel capacity water trucks spray 80 barrels of water per mile per day onto unpaved access roads.
[7] Because access road and pad construction, drilling the water well, drilling and completing the exploration well, and interim reclamation occur sequentially at each site location, typical traffic levels include drilling, completion, service/delivery, and dust control traffic only.
[8] Assumes that one vertical/directional well is being drilled and one vertical/directional well is being completed.
[9] Assumes that two vertical/directional wells are being drilled and one vertical/directional well is being completed.

Depending on the test results of wells drilled during the first year, Noble could drill up to four horizontal wells during following years. If horizontal wells were drilled and completed, peak traffic could occur with one well pad under construction, two drill rigs and one completion team (completing a horizontal well) in operation, supplies being delivered, and dust suppression and interim reclamation being conducted. Under these conditions, peak traffic could potentially include 37 light vehicle and 58 heavy vehicle round trips, for a total of 95 vehicle round trips per day (see Table 2.2-10) This peak traffic would only occur during completion of a horizontal well (21 days for each of four wells) and when two wells were being drilled at the same time.

The estimated peak traffic levels are based on several assumptions about the number of vehicles that would be required for each construction activity (see footnotes to Tables 2.2-8 and 2.2-9). In addition, peak traffic estimates assume that horizontal wells would be drilled and completed, and that the maximum number of vehicles associated with each construction activity would travel on the same day. Typical traffic levels during construction are likely to be lower than the peak traffic estimates shown in Table 2.2-10, depending on the number of construction activities taking place and the extent of each activity being conducted.

Table 2.2-10
Estimated Peak Construction/Drilling Traffic in Year 2 in Vehicle Round Trips per Day

Activity	Duration (days)	Peak Vehicle Round-Trips per Day		
		Light Vehicles	Heavy Vehicles	Total Vehicles
Road and Pad Construction	5 - 7	5[1]	11[2]	16
Water Well Drilling	7 - 10	2	2	4
Drilling[3]	50 to 65	8	3	11
Completion and Flowback	21	12[3]	39[4]	51
Service and Deliveries[3]	65	10	0	10
Dust Control[3]	71	0	2	2
Interim Reclamation	3	0	1	1
Total Peak Construction/Drilling Development Traffic		**37**	**58**	**95**

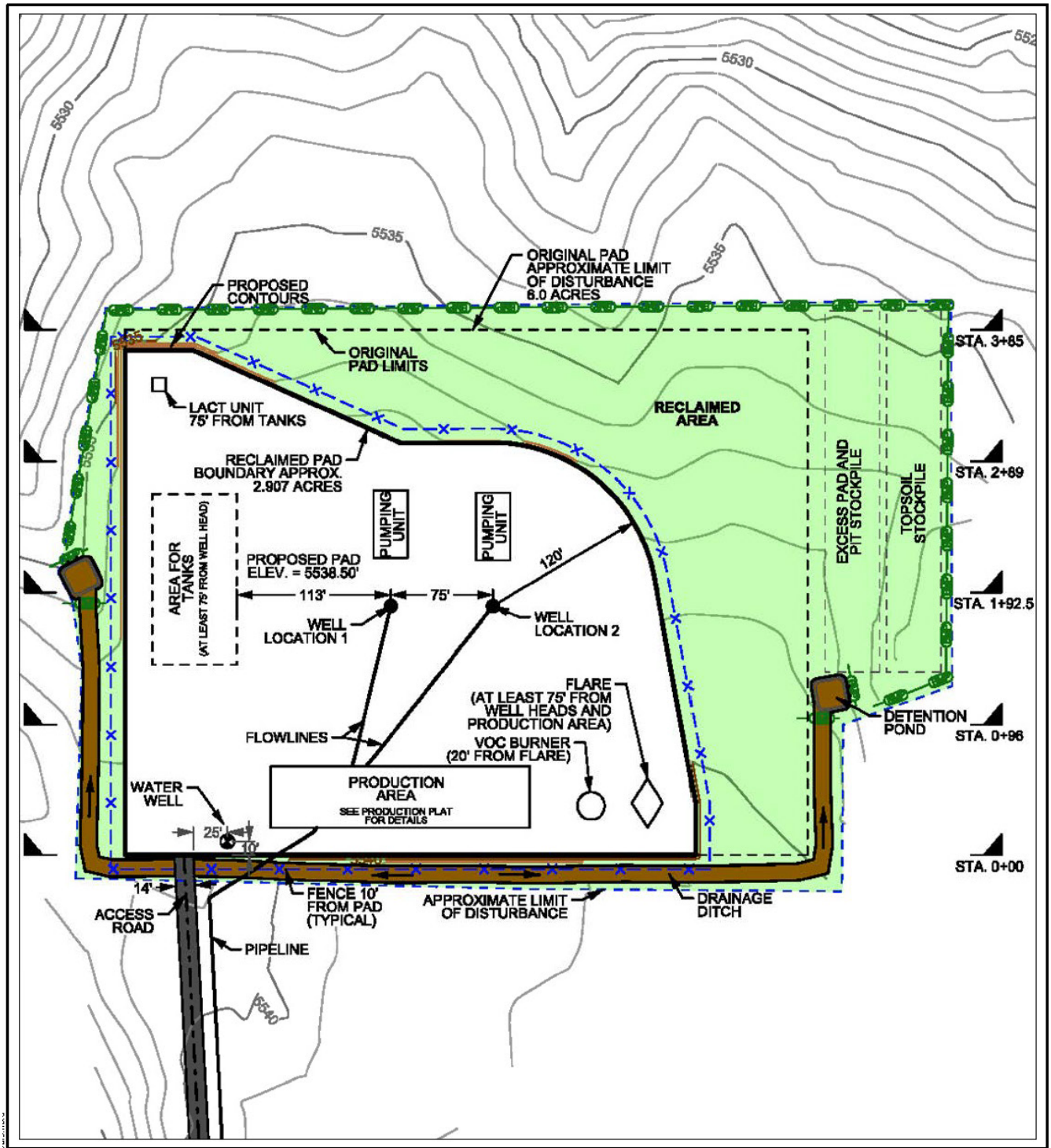
[1] Assumes carpooling, with four personal vehicles for seven workers, and one supervisor light vehicle
[2] Includes 11 dump trucks (23 cubic yard capacity) hauling gravel from gravel pits to well pads and associated roads under construction.
[3] Assumptions are the same as those noted for Table 2.2-9.
[4] Assumes that 30 percent of the water required to complete a horizontal well (60,000 barrels) is hauled in 120 barrel trucks over a 21 day completion period. Assumes that 15 trucks deliver equipment and materials for well completion.

2.2.1.2 Production/Operations Phase

Once wells are drilled and completed, economically viable wells would be placed into production and operated for up to 20 years. The results of the Proposed Action would help Noble determine whether economic quantities of oil can be produced in the Huntington Valley Area.

After all wells have been drilled on the well pad, a working area of the pad would be reclaimed to approximately 3.5 acres per well pad and would remain disturbed throughout the Production/Operations Phase (Figure 2.2-4). The site would undergo final reclamation when all wells on the pad are abandoned (see Huntington Valley Reclamation Plan – Appendix G). Permanent stormwater controls and BMPs would be installed on the exploration/production well pad. Typical exploration/production well pads showing the location of production facilities are shown in Appendix E. Total long-term surface disturbance for 20 well pads is estimated at 70.0 acres. Long-term disturbance refers to bare ground and does not include reclaimed areas.

If the well proves to be economical, production equipment would be installed on the exploration/production well pad after the Construction/Drilling Phase. Equipment and facilities located on the exploration/production well pad may include the wellhead, pumping unit, vertical treater, re-circulating pump, one gas flare, two-phase separator building, line heater, generator, four 400-bbl oil tanks, two 400-bbl water tanks and one fuel tank. If two wells are located on a single well pad, production equipment would be shared to the greatest extent possible.



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Project: Huntington Valley Oil and Gas Exploration Project

Title: Typical Production Location

noble energy

Project No. 013-02			File No.	
GIS:	JST	04/24/2014	Scale: NONE	Rev 0
Check:	MAB	04/24/2014	Figure 2.2-4	
Review:	MAB	04/24/2014		

Oil and water ("produced water") would be pumped from the wellhead, separated, and stored in tanks on-site. Noble anticipates that 12 wells would be fully successful and could produce up to 250 barrels (10,500 gallons) each of oil per day and the remaining wells 8 wells could produce up to 100 barrels (4,200 gallons) each of oil per day. A small amount of natural gas may be produced with the oil which could be used to run the production equipment. Excess natural gas may be flared in accordance with NTL-4A (Royalty or Compensation for Oil and Gas Lost). NTL-4A allows for initial well evaluation tests, not exceeding a period of 30 days or the production of 50 million cubic feet of gas, whichever occurs first, unless a longer test period has been authorized by the appropriate State regulatory agency and ratified or accepted by the BLM. The well testing would determine if the well is an economic producer of oil. If more gas is produced than anticipated, Noble would apply for approval to install gas pipelines and additional NEPA would be required. Hydrogen Sulfide (H_2S) is not expected to be present or released. Noble drilled two wells on private land in Elko County and no detectable H_2S down to 30 ppm (limit of mass spectrometer analysis of mud gas) was found in either well. Based on a review of well histories and logs (Tuano Draw well and the Jiggs federal wells) in Elko County, there is no indication of H_2S. Gas chromatograph results of drilling mud from the isotube detected no H_2S. Any natural gas produced will be tested for H_2S content.

All installed production facilities with the potential to leak or spill oil, condensate, produced water, glycol, or other fluid which might be a hazard to public health or safety would be placed within an appropriate impervious secondary containment structure that would hold 110 percent of the capacity of the largest single container within it for 72 hours. Secondary containment would consist of corrugated steel containment berms or earthen berms. Construction of earthen berms would be performed to prevent lateral movement of fluids through the utilized materials. Earthen berms would be constructed such that transmissivity does not exceed $1x10^{-7}$ centimeters per second. All loading lines would be placed inside the containment berm.

All facilities or structures would be painted a natural color (or BLM Standard Environmental Color if specified by the BLM) in a non-reflective finish that blends with the background landscape. In cases of split estate associated with federal minerals, the surface equipment would be painted in accordance with BLM requirements unless the private surface owner requested differently. Permanent lighting during operations would be manually operated by operations personnel on location and would include lighting for the valve building, treater house, and load rack area.

2.2.1.2.1 Water Requirements and Water Supply

During the Production/Operations Phase, dust suppression may be necessary on unpaved roads without a gravel surface and would be implemented on an as-needed basis. The volume of water required for dust control would depend on annual climatic conditions, but could include up to 500,832 barrels (21.1 million gallons) per year during operations. This estimate of potential maximum water use is based on the expectation that 80 barrels of water per mile per day would be applied to approximately 52 miles of unpaved roads for 120 days. On-site water wells are expected to provide 100 percent of the annual water requirements for dust control (500,782 barrels or 21 million gallons). Up to 30 percent of the water could be provided by off-site sources (Spring Creek Utilities), if necessary for backup. Other methods of dust control could also be used, if approved by the BLM. Constructing roads to Gold Book Standards may reduce water consumption for dust control.

2.2.1.2.2 Oil Production

Oil produced at the wellhead would be stored in on-site tanks located on the exploration/production well pad. Oil would be picked up in 200 barrel (8,400 gallon) tanker trucks and hauled to refineries in Salt Lake City, Utah and California.

2.2.1.2.3 Water Disposal

Recovered water includes the flowback water injected during well completion and formation water condensate (produced water) in the production stream. The amount of water recovered cannot be predicted reliably for a single well, but may be estimated over a field of several wells. Noble estimates that produced water would include approximately 100 barrels (4,200 gallons) per well per day for the 12 wells producing 250 barrels (10,500 gallons) of oil per day, and approximately 40 barrels (1,680 gallons) per well per day for the eight wells producing 100 barrels (4,200 gallons) of oil per day. With 20 producing wells, there could be as much as 1,520 barrels (63,840 gallons) of produced water per day. Produced water would be stored in steel tanks on the production well location.

One option for produced water disposal would be to truck produced water to an approved disposal facility (Clean Harbors) located between Wendover, Nevada and Salt Lake City, Utah. Another disposal option would be for Noble to convert an exploration well on one of the 20 selected pads to a disposal/injection well and to dispose of produced water in this well. The disposal/injection well would be permitted through the Nevada State Engineer's Office and NDEP as an Underground Injection Control (UIC) Class II well. Produced water, drilling fluids, and all waste associated with exploration and production of crude oil, natural gas or geothermal energy is regulated by the federal UIC program, and administered in Nevada by NDEP. Class II UIC facilities are exempted from the Resource Conservation and Recovery Act (RCRA) requirements and therefore, the standard RCRA evaluation is not required. The construction of every exploration well would meet specifications for a disposal/injection well, including proven isolation of the injection zone from all drinking use aquifers.

2.2.1.2.4 Workforce

Table 2.2-11 shows the peak workforce during the Production/Operations Phase. Once all wells are producing, the workforce would peak at 36 workers. This estimate assumes that wells producing 250 barrels (10,500 gallons) of oil per day would generate approximately 100 barrels (4,200 gallons) of produced water per day and that wells producing 100 barrels (4,200 gallons) of oil per day would generate approximately 40 barrels (1,680 gallons) of produced water per day. Under these assumptions, the workforce could be reduced by 10 truck drivers if Noble drilled and operated a produced water disposal/injection well within the Project Area. The number of truck drivers would also be affected by the amount of oil produced per well.

Noble expects that the pumper, maintenance worker, and produced water and dust control truck drivers would come from the local area. Oil truck drivers are expected to be non-local workers employed by crude oil transportation companies headquartered outside Elko County. With off-site produced water disposal, approximately 45 of the operations workforce would be local (17 workers) and 55 percent would be non-local (19 workers). If produced water was disposed in an on-site disposal/injection well, approximately 25 percent of the operations workforce (7 workers) would be local and approximately 75 percent (19 workers) would be non-local.

Table 2.2-11
Estimated Peak Production/Operations Workforce

Workforce Category	Peak Number of Workers
Pumper	1
Maintenance Worker	1
Oil Truck Drivers[1]	19
Produced Water Truck Drivers[2]	13
Dust Control[3]	2
Total Peak Production/Operations Workforce	**36**

[1] Assumes that oil production of 250 barrels (10,500 gallons) per day from 12 wells and 100 barrels (4,200 gallons) per day from eight wells is transported in 200 barrel (8,400 gallon) capacity trucks.

[2] Assumes that 100 barrels (4,200 gallons) of produced water per day from wells producing 250 barrels (10,500 gallons) of oil per day and 40 barrels (1,680 gallons) of produced water per day from wells producing 100 barrels (4,200 gallons) of oil per day are transported in 120 barrel capacity trucks to Clean Harbors. As few as three drivers could be required if produced water is disposed of in an on-site produced water disposal well.

[3] Assumes that 80 barrels (3,360 gallons) of water per mile are sprayed from 100 barrel (4,200 gallon) capacity trucks on an as-needed basis.

2.2.1.2.5 Traffic

During the Production/Operations Phase, project-related traffic would occur 5 days per week. Peak traffic is shown in Table 2.2-12 and would include one pumper truck visiting each exploration/production well pad approximately once per day, one maintenance vehicle visiting each well pad approximately 10 days per year, and two water trucks applying water to unpaved roads on an as-needed basis. With total estimated oil production of 3,800 barrels (159,600 gallons) per day, 19 oil truck trips per day would be required to haul oil to refineries in Salt Lake City, Utah and California. Thirteen water truck trips would be required per day to haul 1,520 barrels (63,840 gallons) of produced water to off-site disposal facilities (Clean Harbors between Wendover, Nevada and Salt Lake City, Utah). Water truck traffic would be contained within the Project Area if produced water is disposed in an on-site disposal/injection well. With up to 20 wells in production, peak traffic during the Production/Operations Phase would include 36 vehicle round-trips per day (see Table 2.2-12). Actual traffic levels during the Production/Operations Phase would be highly dependent on the amount of oil and water produced per well, and would decrease over the life of the project due to declining well productivity.

Table 2.2-12
Estimated Peak Production/Operations Traffic
Requirements in Vehicle Round Trips per Day

Development Phase Component	Peak Vehicle Round-Trips per Day		
	Light Vehicles	Heavy Vehicles	Total Vehicles
Pumper[1]	1	0	1
Maintenance[2]	1	0	1
Oil Trucks[3]	0	19	19
Produced Water Trucks[4]	0	13	13
Dust Control[5]	0	2	2
Total Production Vehicles	**2**	**34**	**36**

[1] Assumes one pumper visit per day per well.
[2] Assumes one maintenance truck serving all wells.
[3] Assumes oil production of 250 barrels (10,500 gallons) per day from 12 wells and 100 barrels (4,200 gallons) per day from 8 wells transported in 200 barrel (8,400 gallon) trucks.
[4] Assumes 100 barrels (4,200 gallons) of produced water per day from wells producing 250 barrels (10,500 gallons) of oil per day and 40 barrels (1,680 gallons) of produced water per day from wells producing 100 barrels (4,200 gallons) of oil per day are transported off-site in 120 barrel capacity trucks. This traffic would be contained within the Project Area if produced water is disposed in an on-site injection well.
[5] Assumes dust suppression on unpaved road surfaces occurs on an as-needed basis.

2.2.1.3 Abandonment and Reclamation

2.2.1.3.1 Well Plugging and Abandonment

Dry/non-producing wells would be plugged, abandoned, and pads and roads reclaimed within 90 days of well completion, weather permitting. Upon well abandonment, a Sundry Notice (written request for approval to perform work not covered by another type of permit) would be submitted to the BLM, and each borehole would be plugged, capped, its related surface equipment removed. The Sundry Notice would describe the engineering, technical, and/or environmental aspects of final plugging and abandonment, as well as final reclamation procedures and any mitigation measures associated with final reclamation. BLM and NDOM standards for plugging and abandonment would be followed. The Sundry Notice would also include a configuration diagram, a summary of plugging procedures, and a job summary with techniques used to plug the wellbore (e.g., cementation).

2.2.1.3.2 Interim Reclamation

After drilling and completion, interim reclamation would occur when the well is put into production (see Reclamation Plan, Appendix G). Noble anticipates that exploration/production well pads would be reduced to approximately 3.5 acres (on average) to accommodate production of the well and the production facilities. Interim reclamation would include:

- Disturbed surfaces to be reclaimed would be prepped and seeded, for stability and to maintain soil viability;
- Slopes would be seeded and matted with appropriate reclamation materials to prevent erosion;
- Weeds would be monitored and treated as approved by the BLM; and
- Access roads would be maintained.

Noble would implement a baseline ecosite vegetation and weed survey for each well pad prior to construction to ensure that a proper seed mix design would be applied to ecosites already existing at the location, and to ensure protection from erosion due to cattle grazing during interim reclamation. Fencing would be determined on a case-by-case basis.

2.2.1.3.3 Final Reclamation

A well pad that no longer had a producing well would undergo final reclamation (see Reclamation Plan – Appendix G). Prior to final reclamation, Noble would meet with the BLM to inspect the disturbed area, review the Reclamation Plan, and agree to any changes to the plan.

Prior to re-contouring and seeding, the following would occur:

- All equipment, facilities, and trash would be removed from the location;
- Each borehole would be plugged, capped, and its related surface equipment removed; and
- Dry hole markers would be subsurface, to prevent their use as perching sites by raptors.

2.2.1.3.4 Water Requirements

Water required during abandonment would be minimal and may include water to mix cement for well plugging. Water would not be used for reclamation.

2.2.1.4 Schedule

Noble would begin construction in the Huntington Valley Project Area upon obtaining all required permits and approvals. Three APDs for two well pads have been submitted for the first year of drilling. The remaining well pads would be constructed during the second year and beyond. Depending on the results of well tests, up to four of the wells drilled after the first year could be horizontal wells. Drilling a vertical/directional well is expected to require approximately 50 days and drilling a horizontal well is expected to require approximately 65 days. Well completions are expected to require between 5 and 21 days (3 to 5 days for hydraulic fracturing). Exploration/production well pad and road construction are expected to require approximately 5 days per well pad; drilling a water well is expected to require between 7 and 10 days; and interim reclamation is expected to require 3 days per well pad. Producing wells are expected to be in operation for approximately 20 years.

2.2.1.5 Site Specific Resource Surveys and Studies

Land. Well pad locations have been staked in the field. A survey of the proposed access roads and well pad locations would be completed by a registered professional land surveyor, and construction plats would be submitted with APDs prior to construction. A preliminary center stake survey with access roads has been completed by a professional land surveyor for well pads on federal lands and on private lands with federal minerals.

Cultural. A Class III Cultural Resource Inventory of the proposed well pads and their access routes was conducted (Corbeil and Rood, 2013). The inventory of the proposed well pads and access roads encompassed 1,906 acres of land including BLM-administered land and private lands where permission was obtained. CRA inventoried 43 locations for the proposed well pads with 27 on BLM-administered land (590 acres) and 16 on private land (307 acres). Four of the 43 well pads surveyed have been dropped due to project redesign. A 20 acre area was inventoried at each proposed well pad location to allow for movement of the well pad disturbance (up to 6.0 acres) should topographical, biological, archaeological, or existing infrastructure issues arise at the preferred location. A total of 47.43 miles of potential access

roads were inventoried using a 200 foot wide corridor equaling approximately 1,009 acres. The two gravel pits and access to them were also inventoried (68 acres).

Biological. In support of the Huntington Valley Seismic EA, weed surveys and groundtruthing of vegetation types was conducted during October and November 2012 (Hayden Wing Associates, LLC - HWA, 2012a).

Preliminary surveys for greater sage-grouse were conducted during spring 2012 (HWA, 2012b). Known sage-grouse leks were surveyed and new or undocumented leks were searched for in and within 3 miles of the Project Area. Three ground surveys were conducted between March 29 and April 12, 2012. Aerial surveys were conducted for greater sage-grouse leks on March 29 and 30, and April 2 and 3, 2012 to search for new or undocumented leks. For this Project, leks were monitored within a 3-mile lek buffer that intersected the Project Area boundary. The 3-mile lek buffer was the standard to date for a protective buffer (Sage-grouse National Technical Team, 2011). A 4-mile buffer, while recommended by the National Technical Team, was not the standard at the time the surveys were completed.

Surveys were conducted for wildlife species of management concern to the Elko District Field Office during October and November, 2012 (HWA, 2012c). BLM-approved block surveys for wildlife (rabbit and grouse sign) and general vegetation were completed. All BLM-administered lands and private lands with landowner permission within the Project Area were surveyed. Perennial wet areas were not surveyed.

Surveys were conducted for wildlife species of management concern to the Elko District Field Office from February to May, 2013 (HWA, 2013a). Surveys were focused on proposed well pads and access roads throughout the Project Area. Known sage-grouse leks were surveyed and new or undocumented leks were searched for in and within 3 miles of the Project Area. Three ground surveys were conducted at each lek location and within 3 miles of the Project Area to determine grouse occupancy and the maximum number of birds attending the lek. Ground surveys were conducted between March 26 and April 13, 2013. Aerial surveys were conducted March 27 to 29 and May 1 to 3, 2013 to search for new or undocumented leks. Opportunistic ground surveys were conducted for raptor species in late March and early April to determine activity status of known nests and to search for new or previously undocumented nests. Block surveys were completed in the fall of 2012 (HWA, 2012c) for seismic activities to locate active pygmy rabbit burrows. Survey efforts in the spring of 2013 focused on proposed well pads. The results of the biological surveys were utilized to adjust proposed well pad locations to minimize effects to pygmy rabbits. Identified gravel pit locations may require additional biological surveys which would be conducted prior to disturbance.

Greater sage-grouse lek surveys were conducted during April 2014 in and within 4-miles of the Project Area. Aerial surveys were conducted for new or undocumented leks during April 9-12 and April 17-19, 2014. Three ground surveys, separated by 7 days, for Carville Creek Lek were conducted to determine grouse occupancy and the maximum number of birds attending the lek during April 10-April 30, 2014. Because of landowner access, Little Cottonwood and Achurra leks were surveyed during the aerial surveys for determining activity of the lek.

Baseline data were collected for bat species within the Project Area in November 2013 (JBR Environmental Consultants, Inc. - JBR, 2013a) for the purpose of incorporation into Noble's Bird and Bat Conservation Strategy (BBCS). The survey area for the baseline acoustic bat survey included approximately 63,495 acres of BLM-administered and private lands in the Huntington Valley Project Area.

A BBCS was prepared in compliance with federal regulations to outline project-specific practices and measure for reducing avian and bat impacts potentially resulting from the Project (JBR, 2013b). The BBCS was developed based on recommendations from the Avian Protection Plan Guidelines prepared by the Edison Electric Institute's Avian Power Line Interaction Committee and the U.S. Fish and Wildlife Service (USFWS) in 2005.

Noise. Noise measurements were conducted in September 2013 for the drilling rig to be used in the Huntington Valley Project Area (J.C. Brennan & Associates, Inc. - Brennan, 2013a). The noise measurements were used to develop noise contours indicating potential noise levels at each proposed well pad and extension of the noise contour at greater sage-grouse leks (Brennan, 2013b). An additional analysis was conducted to determine the effects of snow on sound propagation.

Visual and Auditory (California National Historic Trail – Hastings Cutoff). Noise levels were monitored at ten Key Acoustic Points (KAPs) along the California National Historic Trail (CNHT) Hastings Cutoff route in September 2013 to establish baseline noise values (HWA, 2013b). Minimum guidelines for auditory assessment were issued by the BLM – Elko District Office (Bigelow, 2013). The guidelines were developed through the BLM's assessment of existing NPS and Oregon California Trails Association (OCTA) documents and other current research of general guidance for noise monitoring. The auditory assessment included the following: (1) collection of baseline auditory data at ten KAPs along the portion of the Hastings Cutoff Trail that occurs within the Project Area, and (2) determination of potential decibel encroachment generated by the proposed disturbance through the creation of noise propagation models reflecting the predicted decibel levels created by the Project.

A visual and auditory assessment was completed of potential visual and auditory intrusions to the CNHT – Hastings Cutoff to both its National Register of Historic Places eligibility status and of the nature and purposes for which the CNHT was established by Congress. Recommendations were made regarding mitigation of adverse effects or adverse impacts (Williamson et al., 2013).

2.2.1.6 Project Design Features (Resource Protection Measures)

The following Project Design Features are applicant-committed measures included in Noble's MSUPO for the Huntington Valley Oil and Gas Exploration Project. They are specifically intended to reduce potential damage to existing infrastructure, the natural environment, and historical sites.

Cultural

- Prior to commencement of construction, Noble would inform all employees and contractors through job site safety orientations about compliance requirements associated with the Archaeological Resources Protection Act, the Native American Graves Protection and Repatriation Act, the Paleontological Resources Preservation Act, and the National Historic Preservation Act.
- Noble would suspend all operations that further disturb such materials and immediately contact the BLM AO. Construction would not resume until authorization to proceed is issued by the BLM AO.

National Historic Trails

- Noble would apply the following measures to exploration/production well pads G20L, K1P, J5H, J8E, and J8M which would be visible from several Key Observation Points (KOPs) with weak to moderate degree of contrast.

    - Use low profile 10 ft. (3 meter) high tanks instead of the standard 20 ft. (6 meter) storage tanks.
    - Use paint colors chosen by the BLM to blend with the surrounding landscape.
    - Avoid clearing the pad in a geometric shape, and instead utilize a more organic outline with rounded corners.
    - Leave as much vegetation in place as possible and reseed with native species during the interim reclamation as well as during final reclamation.
- Locate Well Pad J8E in the northwest corner of the 20-acre survey block so that the well pad is out of sight of a visitor to the auto-tour marker.

Invasive Non-Native Species and Noxious Weeds

- Noble has prepared and would implement measures in the BLM-approved Huntington Valley Integrated Weed Management Plan (Appendix F).

Wildlife and Sensitive and Special Status Species

- Noble has prepared and would follow Greater Sage-Grouse Best Management Practices (Appendix I).
- Noble would inform employees and contractors that harassing (including feeding, approaching, pursuing, or otherwise intentionally disturbing) or shooting of wildlife would not be permitted; dogs may not be brought to the Project Area; no firearms would be allowed on-site; and there will be no littering, including trash that was not secured properly and has been dispersed by wind.
- Noble would conduct pre-disturbance surveys for pygmy rabbits before each well pad location is constructed.
- Noble would implement protective measures using adaptive management and a phased approach to reduce impacts to greater sage-grouse, pygmy rabbits, and critical winter pronghorn habitat. A Wildlife Working Group would be composed of Noble, NDOW, and the BLM to design Adaptive management measures that would be implemented as the project progressed each year with surface disturbances.

Bird and Bat Conservation Strategy

Noble has voluntarily prepared a BBCS designed to reduce the potential risks of bird and bat mortality that may result from implementing the Proposed Action. The BBCS includes the following protection measures that Noble would use during the Construction/Drilling Phase and the Production/Operations Phase which would extend for the life the Project, approximately 20 years (JBR, 2013a):

- If vegetation clearing is planned during the core nesting period (March 15 through July 31), surveys shall be conducted 7 to 10 days prior to clearing. If nests are found within areas where vegetation would be removed, surface disturbances would not occur until after July 31. If no nests are found, clearing would be possible with no timing limitation if conducted with 14 days of the survey.
- All open pipes shall be capped or filled to prevent birds from becoming trapped.
- All exhaust stacks shall be screened and outfitted with anti-perching devices to prevent bird or bat entry and to discourage perching, roosting, and nesting. Caps and screens shall be checked regularly to ensure they are effective.
- Garbage shall be removed at frequent intervals to avoid attracting scavengers and avian predators to the pad vicinities.
- No vehicles shall be parked off pad or road disturbance to avoid contamination, crushing nests, or ignition of fires.

- The maximum speed limit for all project vehicles in the Project Area will be no more than 20 mph.
- Employees and contractors must stay on pad areas for the duration of the shift and not wander into surrounding areas.
- All reasonable, prudent, and effective measures such as using suitable mufflers on all internal combustion engines and implementation of only authorized access shall be used to reduce potential impacts to migratory birds and bats.

In addition, Noble has agreed to avoid effects by:

- Lighting (when used) would be controlled to minimize the potential for avian and bat collisions (i.e. angled down).
- Any potentially toxic material that would pose a threat to bird and bat species would be stored on-site and protected in such a way as to prevent and control potential spills.
- If land-clearing activities take place during the avian breeding season, a qualified biologist would conduct preconstruction surveys in the affected area to identify nests and breeding birds.
- During Project operations, vehicles would travel on project roads to minimize destruction of the native habitat in the Project Area.
- Noble would limit Project disturbance to the area within the perimeter fence of each well pad and the new and upgraded roads to the extent possible thus, maintaining local vegetation outside of the disturbed area that would maintain nearby nesting and foraging habitat for avian and bat species.
- Noble would construct the minimum amount of new roads to accomplish their Proposed Action. Areas disturbed would be reclaimed with a BLM approved seed mix to help restore vegetation in cleared areas.
- After completion of the Project, the area will eventually be restored to pre-project like conditions.

Noble has agreed to the following reporting procedures that would be implemented over the life of the project:

- Noble's Environmental Representative would complete and submit a Wildlife Mortality Report Form to NDOW within 24 hours of a mortality.
- All appropriate Noble personnel, including managers, supervisors, crews, and engineers would be provided with instruction on implementing the methodology and properly reporting bat and avian mortality. The reporting of avian and bat mortality would be standard practice by Noble for the duration of the Project.
- Noble personnel would be provided with a standardized Wildlife Mortality Report Form for recording the necessary information when an incident is detected. Information on the species that may be encountered will be provided by Noble to its employees to aid identification.
- In the event that an avian nesting site is observed within the Project Area through monitoring or incidental observations, Noble personnel would record the circumstances and conditions associated with the nest site and nest. The recorded information would be used by Noble in coordination with the BLM to determine if the nest and its locations present risk of injury or mortality to the nesting birds, and if the nest presents risk to the functionality of the Project.
- Over the course of operation and maintenance of the Project, Noble's Environmental Department would gather, review, and report the monitoring data from site investigations and any mortality reports resulting from structures that are found to create avian or bat mortality issues. The information received from the monitoring data would be used to

prioritize, in collaboration with the agencies, future changes in monitoring and addressing potentially problematic areas and/or structures.

Vegetation

- Noble has prepared and would implement measures in the BLM-approved Huntington Valley Reclamation Plan.
- Prior to construction, Noble would implement a baseline ecosite vegetation and weed survey for each well pad to ensure that a proper seed mix design would be applicable to ecosites already existing at the location, and to ensure protection from erosion due to cattle grazing during interim reclamation.

Public Health and Safety

- Project-related vehicle traffic would be limited to designated roads included in the Proposed Action.
- Project-related vehicles would travel at speeds within set speed limits for main roads and would not exceed 20 miles per hour on local and resource roads.
- Noble would conduct a Job Site Assessment meeting prior to kick off with the entire Project team and have daily safety tailgates each morning.
- All contractors would be required to have a Health and Safety Plan, which would include emergency response protocol, written and implemented specific to project requirements.

Water Resources, Wetland and Riparian Areas

- Proposed well pads and the majority of access roads have been sited at least 400 feet from streams, creeks, springs, and riparian areas and the Zunino/Jiggs Reservoir. However, approximately 3.97 miles of existing road proposed for access and 0.04 mile of new road are within the 400 foot riparian area buffer. Existing roads proposed for upgrading within the 400 foot buffer would not be upgraded outside the existing disturbance. Proposed new road locations would be addressed during permitting. There is no proposed disturbance within a 400 foot buffer around the Zunino/Jiggs Reservoir.
- Fueling would not occur within 400 feet of any riparian areas or standing or flowing surface water including streams, ponds, springs, seeps and stock reservoirs.
- Noble would prepare and implement a Spill Prevention Plan in accordance with state regulations, and any spills would be handled and reported according to federal and state regulations.
- Noble would prepare and implement a Stormwater Pollution Prevention Plan in accordance with state regulations.
- Noble would clean up diesel, hydraulic fuel, or other spills, including contaminated soils. All spill-related material would be hauled to an approved disposal site.
- Noble would comply with BLM's proposed rule to regulate hydraulic fracturing on public and Indian land (BLM, 2012a). The proposed rule provides disclosure to the public of chemicals used in hydraulic fracturing on public and Indian land, strengthens regulations related to well-bore integrity, and addresses issues related to flowback water. The rule has been proposed to provide useful information to the public and to assure that hydraulic fracturing is conducted in a way that adequately protects the environment.
- Noble would participate in FracFocus, which is a national hydraulic fracturing chemical registry managed by the Ground Water Protection Council and Interstate Oil and Gas Compact Commission; two organizations concerned with conservation and environmental protection. The primary purpose of the registry is to provide information concerning hydraulic fracturing and groundwater protection (FracFocus, 2014).

- Noble has entered into a Memorandum of Understanding (MOU) with the State of Nevada through the NDOM, the NDEP, and the Board of Regents of the Nevada System of Higher Education on behalf of the Desert Research Institute (DRI) to establish the Aquifer Quality Assessment Program (Aqua Program) to gather and share data and information on groundwater and geological conditions associated with the fate and transport of chemicals used for hydraulic fracturing. The MOU is included as Appendix J.

Fire Protection

- Noble has prepared and would implement Fire Prevention Plan measures (Appendix K).

2.2.2 WELL PAD K2J ACCESS ALTERNATIVE

The proposed access to Well Pad K2J (one of the well pads for which an APD has been submitted) is within the 3-mile buffer of the Branzell Lek for approximately 1,205 feet and would require 0.29 acres of disturbance for construction of the new local road. Under this alternative, the access would not go through the 3- mile lek buffer. Access to the proposed well pad would still be along Circle L Ranch Road (which does not require upgrading); however, the new local road would begin 1,220 feet to the east of the proposed local road (see Map 2.2-2). The local road would be 2,062 feet under this alternative compared to 1,670 feet under the Proposed Action. The increase in the length of the local road (392 feet) would result in additional disturbance of 0.28 acre of surface disturbance under this alternative.

2.2.3 NO ACTION ALTERNATIVE

In accordance with NEPA and CEQ regulations that require that a No Action Alternative be presented in all environmental analyses in order to serve as a “base line” or “benchmark” from which to compare all proposed “action” alternatives, a No Action Alternative is analyzed in this EA.

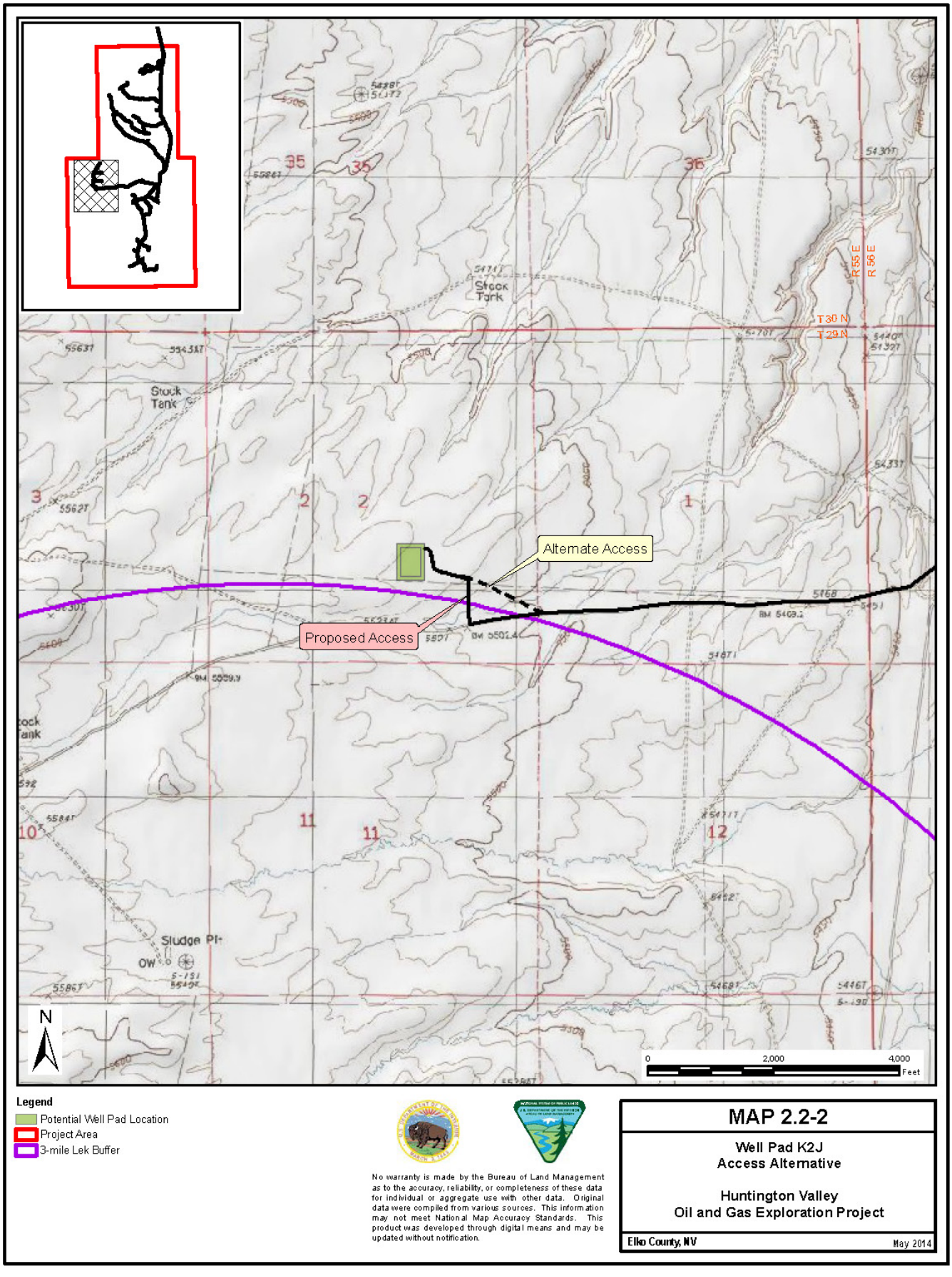
Under the No Action Alternative, the Tuscarora Field Manager would not approve Noble’s MSUPO for the Huntington Valley Oil and Gas Exploration Project and the Proposed Action would not be implemented.

2.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

If an alternative is considered during the environmental analysis process but the agency decides not to analyze the alternative in detail, the agency must identify those alternatives and briefly explain why they were eliminated from detailed analysis (40 CFR 1502.14).

Two alternative access routes were initially considered to Merkley Pit 1 before selecting the northern spur of eastbound Smith Creek Road to be part of the Proposed Action (see Transportation Plan for route description). Alternative 1 (see Map 2.3-1) exits SR 228 near the Jiggs School and turns east onto the southern spur of Smith Creek Road. The access route follows this southern spur for approximately 0.25 miles, passing the Jiggs School providing access to the Merkley Pit 1 from the south. This access route was abandoned due to potential impacts associated with the school.

Alternative 2 (see Map 2.3-1) exits SR 228 approximately 0.4 mile south of the SR 228-eastbound Smith Creek Road (northern spur) intersection and continues 0.2 mile on an existing two-track that would have required upgrading to access the Merkley Pit 1 from the north. This route was rejected by the Nevada Department of Transportation (NDOT) because the location did not allow for adequate line-of-sight for safe access onto SR 228 and therefore was not carried forward for analysis.



Legend

- Potential Well Pad Location
- Project Area
- 3-mile Lek Buffer

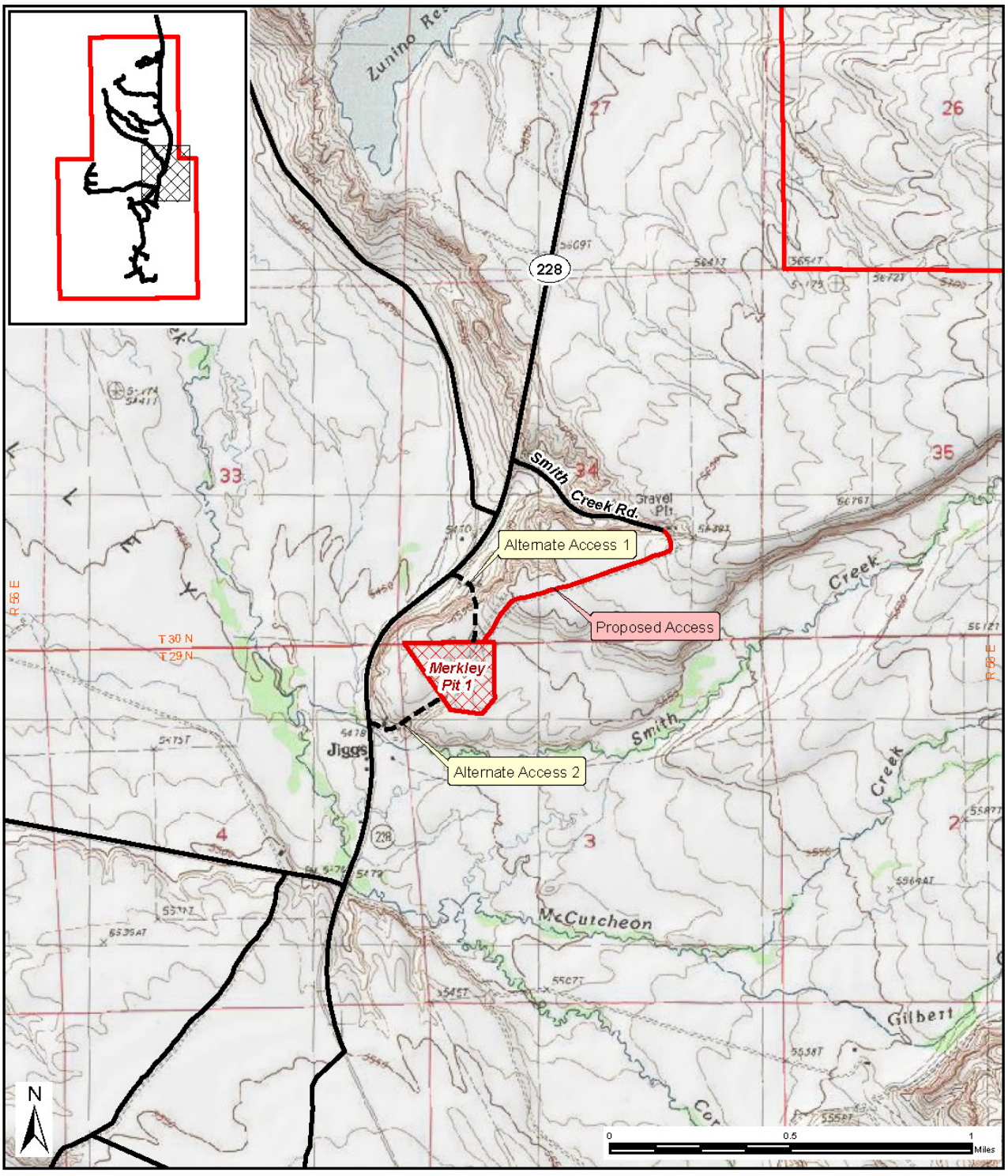
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

MAP 2.2-2

Well Pad K2J
Access Alternative

Huntington Valley
Oil and Gas Exploration Project

Elko County, NV — May 2014



Legend

Project Area

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

MAP 2.3-1

Merkley Pit 1
Alternate Access Routes

Huntington Valley
Oil and Gas Exploration Project

Elko County, NV — May 2014

CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

3.1 INTRODUCTION

Critical elements of the human environment specified by statue, regulation, or Executive Order (EO) are described and analyzed in this section. Any element not present within the Project Area or any element that would not be affected by the Proposed Action, Well Pad K2J Access Alternative, or No Action Alternative will not be analyzed in this document. Therefore, this section provides a description of the human and natural environmental resources that could be affected by the Proposed Action, Well Pad K2J Access Alternative, and the No Action Alternative.

The BLM determined which resources would be brought forward for analysis by evaluating whether the resources were present within the Project Area and whether the Proposed Action would impact those resources. Resources that could potentially be impacted are analyzed in this EA. Table 3.1-1 presents that resource evaluation.

Table 3.1-1
Potentially Affected Resources

Resources*	Not Present	Potentially Affected	Mitigation necessary
Air Quality and Climate	☐	☒	☐
Cultural Resources	☐	☒	☒
Environmental Justice	☐	☒	☐
Fire Management	☐	☒	☒
Forestry and Forest Products	☒	☐	☐
Geology and Mineral Resources	☐	☒	☒
Hydrology	☐	☒	☒
Invasive, Non-Native Species	☐	☒	☐
Land Tenure, ROW, Other Uses	☐	☒	☒
Livestock Grazing/Rangeland Health	☐	☒	☒
Migratory Birds	☐	☒	☒
National Historic Trails	☐	☒	☒
Native American Concerns	☐	☒	☒
Paleontological Resources	☐	☒	☒
Recreation	☐	☒	☐
Socioeconomic	☐	☒	☐
Soils	☐	☒	☐
Sensitive and Special Status Species	☐	☒	☒
Special Designations, ACECs	☒	☐	☐
Transportation and Access	☐	☒	☐
Vegetation	☐	☒	☐
Visual Resources Management	☐	☒	☐
Wastes (Hazardous or Solid)	☐	☒	☐
Wilderness Study Areas and Lands with Wilderness Characteristics	☐	☒	☒
Wild Horses	☒	☐	☐
Wildlife and Fisheries	☐	☒	☒

*See Statute: NV-2009-030, BLM Manual, regulation or order that may require an element be addressed in a NV BLM EA.

Environmental effects analysis was based upon available data and literature from state and federal agencies, peer-review scientific literature, and resource studies conducted in the Project Area. Comparison of effects is intended to provide an impartial assessment to help inform the decision-maker and the public. Actions resulting in adverse effects to one resource may impart a beneficial effect to other resources. For each resource analyzed, environmental consequences include:

- **direct effects –** effects that are caused by the action, and that occur at the same time and in the same general location as the action.

- **indirect effects –** effects that occur at a different time or in a different location than the action to which the effects are related.

- **cumulative effects** – effects on the environment that result from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such actions.

- **short or long-term effects –** when applicable, the short-term or long-term aspects of effects are described. For the purposes of this EA, short-term effects occur during or after the activity or action and may continue for up to 5 years. Long-term effects occur beyond the first 5 years.

The predicted intensity and duration of effects from implementation of the Proposed Action for each resource were evaluated to determine how these effects could be avoided or reduced through the application of mitigation measures. The design features included in the MSUPO (Noble, 2014) were evaluated for their ability to reduce expected effects. The need for additional measures was then determined for each resource, based on the expectation that potential effects could be further reduced or avoided. Additional mitigation measures were included for each resource, if appropriate.

Cumulative Effects

Cumulative effects are defined in the CEQ regulations (40 CFR 1508.7) as "...the impact on the environment that results from the incremental impact of the action when added to other past, present and reasonably foreseeable actions regardless of what agency (federal or non-federal) or person undertakes such other actions." The cumulative effects analysis typically encompasses broader areas and timeframes than the analysis of direct and indirect effects. The actions and effects selected for analysis depend on access to reasonably available data. For the cumulative analysis, levels of surface disturbance are used as best estimates for total impacts to the human environment. The rationale is that levels of surface disturbance are among the most comprehensive and readily determined impacts and because disturbance to the surface results in direct and indirect effects to many analyzed resources.

The Programmatic EA for the December 2005 Oil & Gas Lease Sale (BLM, 2005) included a Reasonably Foreseeable Development Scenario for oil and gas activities within the BLM Elko District (Appendix C to the 2005 EA), which estimated an average of 80 exploration holes and 1,693 acres of surface disturbance over the 15-year projection. Since 2005, six wells (approximately 107 acres of disturbance) have been drilled in the BLM Elko District. Combining the proposed Marys River Oil and Gas Exploration Project (277 acres) and the Proposed Action (314 acres), up to 40 wells could be drilled over the next several years within the BLM Elko District, totaling 698 acres.

The areas to be analyzed for cumulative effects have been selected based on several criteria. Common analysis areas have been used for different resources, where such usage is logically defensible. Table 3.1-2 provides the rationale for the cumulative effects analysis by resource and identifies the Cumulative Effects Study Areas (CESAs). Cumulative effects are analyzed within the specific resource sections. Maps 3.1-1 through 3.1-7 depict seven of the 10 CESA boundaries described in Table 3.1-2. Maps 3.1-8, 3.1-9, 3.1-10, and 3.1-11 depict the same CESA boundary but provide the individual seasonal ranges for pronghorn, mule deer, and elk within the CESA. The remaining two CESA boundaries are the Project Area boundary and Elko County.

Generally, past and present activities (natural and man-made) that have affected and are affecting the Project Area and surrounding areas include:

- mining;
- oil and gas exploration and development;
- rights-of-ways (power lines, pipelines, roads);
- wildland fire;
- drought;
- wildlife utilization;
- vegetation treatments;
- climate change;
- livestock grazing;
- dispersed recreation (i.e., hunting, camping, etc.); and
- off-highway vehicle (OHV) use.

The Reasonably Foreseeable Future Actions (RFFAs) describe proposed projects which may be constructed in the CESAs in the reasonably foreseeable future. To be included in the RFFAs, a proposed future action must have a high probability of occurrence and be defined well enough to consider in any cumulative effects analysis.

Surface disturbance for the following past and present actions and RFFAs has been quantified and included in the cumulative analyses where those actions were or are located within a resource's CESA boundary. The acreages are conservative, using the total area of the project boundaries in some cases (noted below) to calculate the surface disturbance rather than the areas within the boundaries actually disturbed by the specific projects.

- **Carlin Trend Mines.** The Carlin Trend is generally defined as the area from the Midas Mine located approximately 50 miles northwest from Carlin, south to the Emigrant Mine located approximately 10 miles southeast of Carlin. Total surface disturbance associated with mining activities in the vicinity of the Carlin Trend is over-estimated to be 60,357 acres (based on total project area rather than actual surface disturbance).
- **Emigrant Mine.** Newmont Mining Corporation's open pit gold mine, located 10 miles south of Carlin, Nevada, includes development of an open pit mine, waste rock disposal facility, heap leach pad, permanent stream diversion channel, and ancillary support facilities. Surface disturbance is estimated to be 1,432 acres and is included within the Carlin Trend estimated acreage. A Decision Record was signed on January 25, 2011.
- **Rain Mine.** Development of the Rain Mine began in 1988 and included an open pit, waste rock disposal site, tailing impoundment, mill facility, and heap leach pad. Total disturbance area for the Rain Mine is 961 acres, which is included in the Carlin Trend estimated acreage. Mining operations ceased in 2002, with leaching of ore estimated to continue until 2015. Final reclamation of the Rain Mine is expected to be completed by 2030.
- **Woodruff Exploration Project.** Activity at the Woodruff Exploration Project includes road building, drilling, and trenching. Total permitted disturbance acreage is 66 acres, which is included in the Carlin Trend estimated acreage.

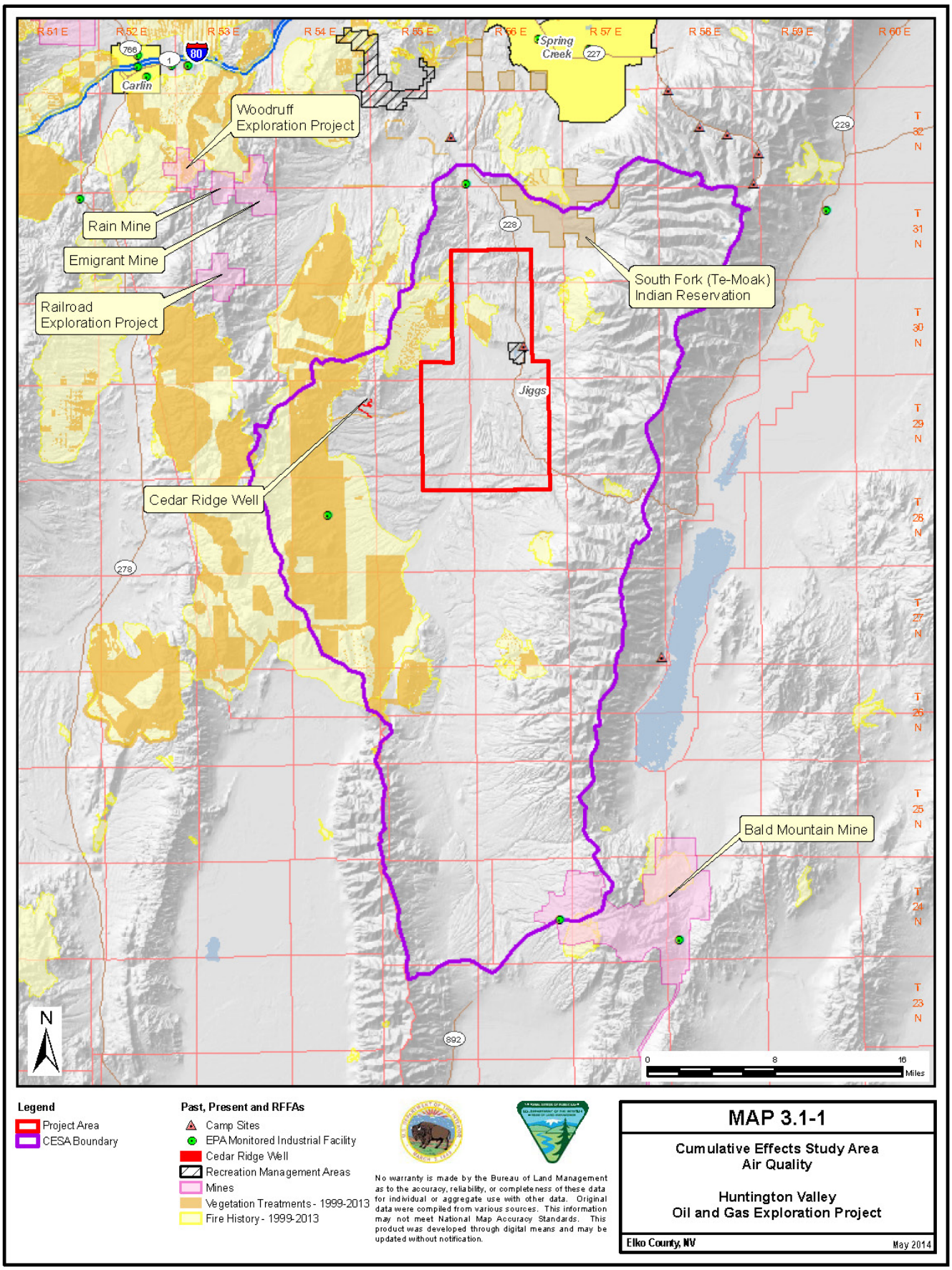
- **Railroad Exploration Project.** This mineral exploration project located in the Railroad Mining District, approximately 25 miles southwest of Elko includes access road maintenance, road building, drill pad construction, exploration drilling, and concurrent reclamation. The project area encompasses 3,169 acres. A Decision Record was signed on October 12, 2012.
- **Bald Mountain Mine**. Barrick Gold U.S. has proposed expansion of the Bald Mountain Mine in White Pine County, 70 miles northeast of Ely and 30 miles northeast of Eureka. Bald Mountain is the largest mine site by area in the United States. The proposal calls for the expansion of existing mine facilities. Expansion would increase the total surface disturbance from 9,124 acres to 13,704 acres. Establishing the South Operations Area Project would increase the total surface disturbance from 960 acres to 3,643 acres. Total surface disturbance is over-estimated to be 42,517 acres (based on total project area rather than actual surface disturbance).
- **North Elko Pipeline.** This is a 24.2-mile, 12-inch, buried natural gas pipeline mostly within Elko County, with the southern two miles in Eureka County. The pipeline carries natural gas from the Ruby Pipeline to the mining operations at the Barrick Goldstrike Mine. Total proposed temporary disturbance is 246 acres. A Decision Record was signed on August 7, 2012.
- **Long Canyon Mine.** The project is a proposed open pit gold mine located on the east side of the Pequop Mountain range, 30 miles east of Wells, which includes an open pit, a heap leach pad, waste rock storage facility, a tailing storage facility, water supply wells, milling facilities, mine haul roads, and other ancillary facilities. The associated disturbance for the proposed operations is 4,194 acres.
- **Dee Arturo Mine.** The project proposal would expand the existing open-pit Dee Gold Mine, located 45 miles northwest of Elko, and would disturb a total of 2,774 acres. The Final EIS was completed in March 2014 and a Decision Record is pending.
- **Eureka Natural Gas Pipeline.** This is an 18-mile, 12-inch, buried natural gas transmission pipeline in Eureka County, which begins at the Goldstrike Meter Station and delivers gas to the Newmont Leeville and Gold Quarry Mines north of Carlin. The total proposed temporary disturbance is 270 acres. A Decision Record was signed on April 17, 2014.
- **Fiber optic lines.** Rural Telephone Company requested a 20-foot right-of-way for 37 miles of underground fiber optic telecommunications lines (90 acres). The lines would serve rural areas of northwestern Elko County. The project consists of two segments, one from Tuscarora to Lone Mountain Station and the second from Dinner Station to Adobe Ranchos.
- **Cedar Ridge Well.** This exploration well would be located approximately 3 miles west of the Huntington Valley Project Area boundary. The proposed well pad and road would disturb approximately 12 acres.
- **H33P Well.** This exploration well would be located approximately 24 miles northeast of the Huntington Valley Project Area boundary and would disturb approximately 5 acres. It would be near two existing wells (M10C and M2C), which have disturbed approximately 11 acres combined.

The identified past and present actions and RFFAs are shown on Maps 3.1-1 through 3.1-11.

Table 3.1-2
Cumulative Effects Rationale

Resource	Cumulative Effects Study Areas		
	Cumulative Effects Study Areas Boundary	**Acres**	**Cumulative Effects Study Areas Rationale**
Air Quality and Climate	Huntington Valley and South Fork Area Air Basins (Map 3.1-1)	567,079	Sufficient area to represent regional airshed and to evaluate project impacts at federal Class I and sensitive Class II areas.
Cultural Resources	Project Boundary	63,495	Effects are not anticipated outside the project boundary.
Paleontological Resources			
Fire Management			
Land Tenure, Rights-of-Way and Other Uses			
Recreation			
Visual Resource Management			
Geology and Minerals	Project Boundary with a 3-mile buffer (Map 3.1-2)	N/A	This area is considered sufficient to analyze effects to geologic resources from the Project in conjunction with other projects in the vicinity.
Wilderness Study Areas	Area centered on the Red Spring and Cedar Ridge WSAs (Map 3.1-3)	267,607	Effects are not anticipated from the Proposed Project; therefore this area is deemed sufficient for a cumulative analysis.
National Historic Trails	½ mile buffer along the trail to the north and the south of the project boundary (Map 3.1-4)	10,868	Based on the low potential for Project effects, a ½-mile buffer is sufficient for a cumulative analysis.
Native American Concerns	Watershed (Map 3.1-5)	833,399	The boundary of the South Fork Humboldt watershed (Hydrologic Unit Code - HUC16040103), within the Upper Humboldt watershed, has been used as the geographic scope for the cumulative analysis area for these resources. Potential effects of the Proposed Action would not be likely to result in any issues to these resources outside of this area.
Hydrology			
Invasive, Non-Native Species			
Soils			
Migratory Birds; Special Status Species; Wildlife and Fisheries			
Vegetation			
Special Status Species/Greater Sage-grouse	South Fork PMU (Map 3.1.6)	966,019	The Project Area is located in the South Fork Population Management Unit for Sage-grouse.
Livestock Grazing/Rangeland Health	Extent of affected grazing allotments (Map 3.1-7)	186,685	The boundary is the extent of the grazing allotments affected by the Proposed Action. Effects to a portion of an allotment could cumulatively effect the entire allotment.
Wildlife/Pronghorn	Big Game Management Area 6 (Hunt Units 064, 065, and 068) and Management Area 10 (all Hunt Units)	6,150,495	Consideration of the units listed provides perspective of the seasonal range use in relation to the Proposed Action.
Wildlife/Mule Deer			

Resource	Cumulative Effects Study Areas		
	Cumulative Effects Study Areas Boundary	**Acres**	**Cumulative Effects Study Areas Rationale**
Wildlife/Elk	(Maps 3.1-8, 3.1-9, 3.1-10, 3.1-11)		
Environmental Justice	Elko County	N/A	Effects associated with these resources occur where concentrations of people are located, within the stream of commerce, and along roads. Surface disturbance is not an issue, so an acreage has not been provided. Effects are discussed within Elko County.
Socioeconomics			
Transportation and Access			
Wastes (Hazardous or Solid)			


R 51 E
R 52 E
R 53 E
R 54 E
R 55 E
R 56 E
R 57 E
R 58 E
R 59 E
R 60 E
Carlin
Spring Creek
Woodruff Exploration Project
Rain Mine
Emigrant Mine
Railroad Exploration Project
South Fork (Te-Moak) Indian Reservation
Jiggs
Cedar Ridge Well
Bald Mountain Mine
T 32 N
T 31 N
T 30 N
T 29 N
T 28 N
T 27 N
T 26 N
T 25 N
T 24 N
T 23 N
N
0
8
16
Miles
Legend
Project Area
CESA Boundary
Past, Present and RFFAs
Camp Sites
EPA Monitored Industrial Facility
Cedar Ridge Well
Recreation Management Areas
Mines
Vegetation Treatments - 1999-2013
Fire History - 1999-2013
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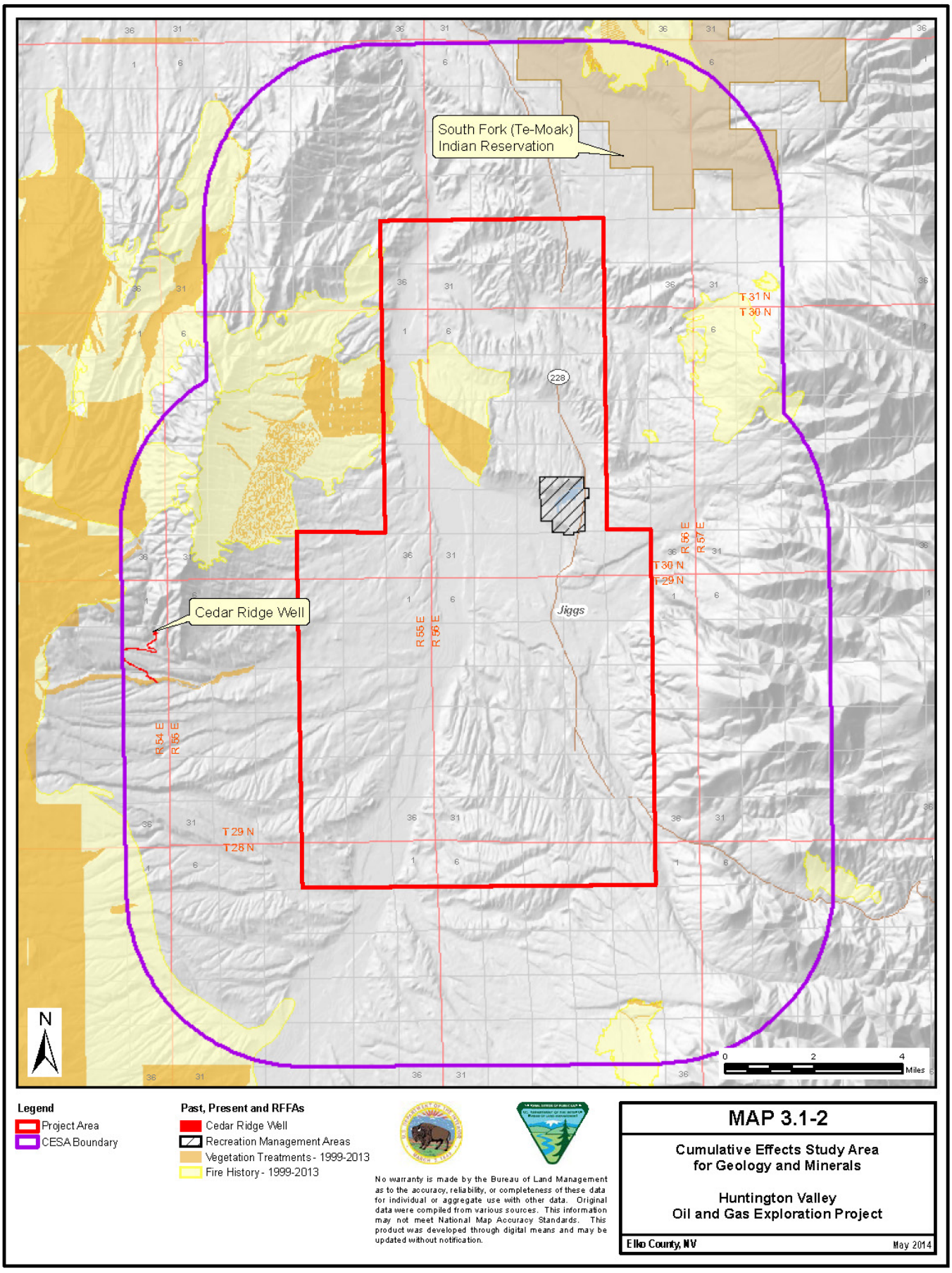
MAP 3.1-1
Cumulative Effects Study Area
Air Quality
Huntington Valley
Oil and Gas Exploration Project
Elko County, NV
May 2014



Legend

- Project Area
- CESA Boundary

Past, Present and RFFAs

- Cedar Ridge Well
- Recreation Management Areas
- Vegetation Treatments - 1999-2013
- Fire History - 1999-2013

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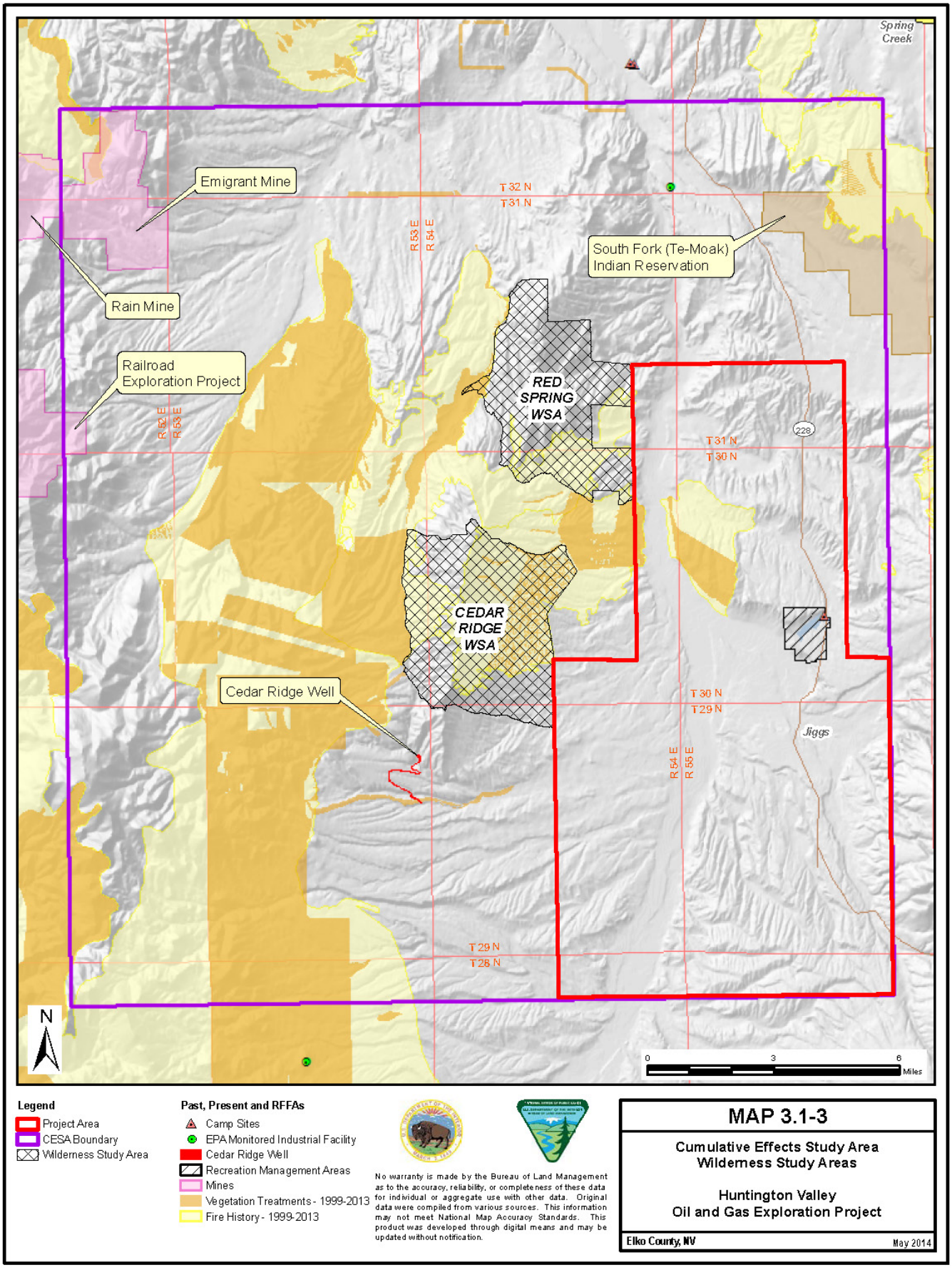
MAP 3.1-2

Cumulative Effects Study Area for Geology and Minerals

Huntington Valley Oil and Gas Exploration Project

Elko County, NV — May 2014


Spring Creek
Emigrant Mine
Rain Mine
Railroad Exploration Project
South Fork (Te-Moak) Indian Reservation
T 32 N
T 31 N
R 53 E
R 54 E
R 52 E
R 53 E
RED SPRING WSA
CEDAR RIDGE WSA
Cedar Ridge Well
T 31 N
T 30 N
228
T 30 N
T 29 N
Jiggs
R 54 E
R 55 E
T 29 N
T 28 N
N
0
3
6
Miles
Legend
Project Area
CESA Boundary
Wilderness Study Area
Past, Present and RFFAs
Camp Sites
EPA Monitored Industrial Facility
Cedar Ridge Well
Recreation Management Areas
Mines
Vegetation Treatments - 1999-2013
Fire History - 1999-2013
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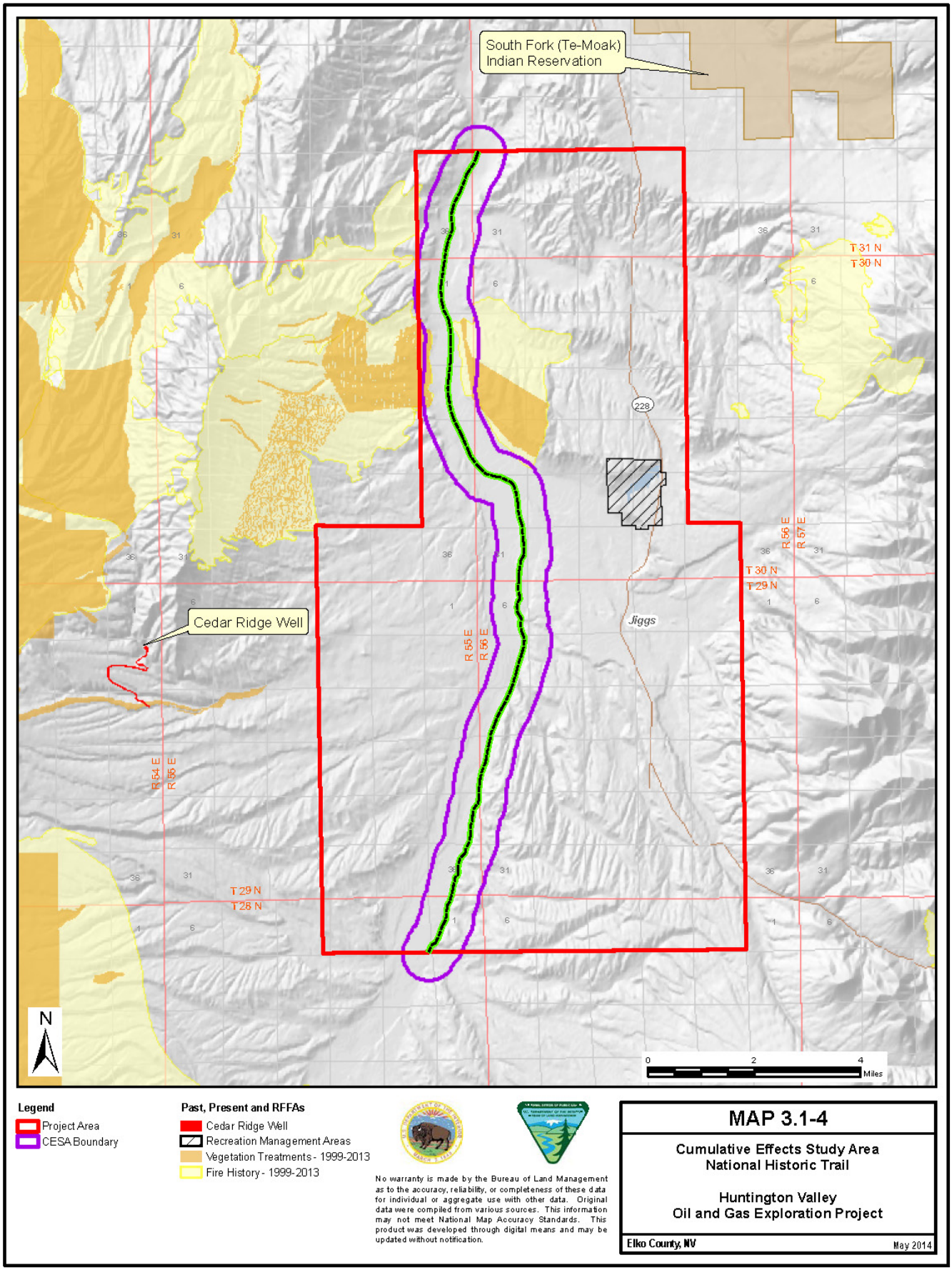
MAP 3.1-3
Cumulative Effects Study Area
Wilderness Study Areas
Huntington Valley
Oil and Gas Exploration Project
Elko County, NV
May 2014


South Fork (Te-Moak)
Indian Reservation
Cedar Ridge Well
Jiggs
228
T 31 N
T 30 N
T 30 N
T 29 N
T 29 N
T 28 N
R 54 E
R 55 E
R 55 E
R 56 E
R 56 E
R 57 E
N
0
2
4
Miles
Legend
Project Area
CESA Boundary
Past, Present and RFFAs
Cedar Ridge Well
Recreation Management Areas
Vegetation Treatments - 1999-2013
Fire History - 1999-2013
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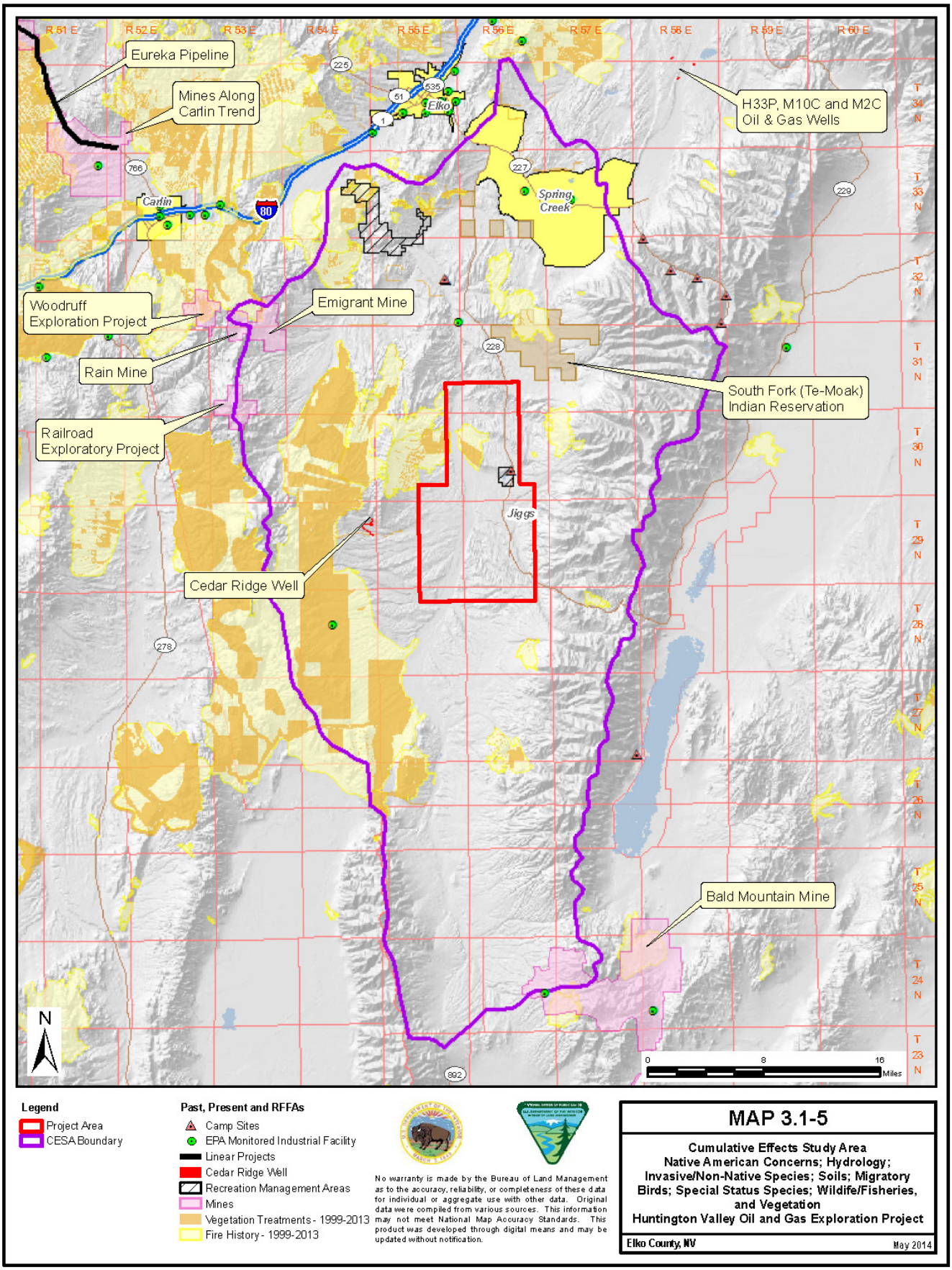
MAP 3.1-4
Cumulative Effects Study Area
National Historic Trail
Huntington Valley
Oil and Gas Exploration Project
Elko County, NV
May 2014



Legend

- Project Area
- CESA Boundary

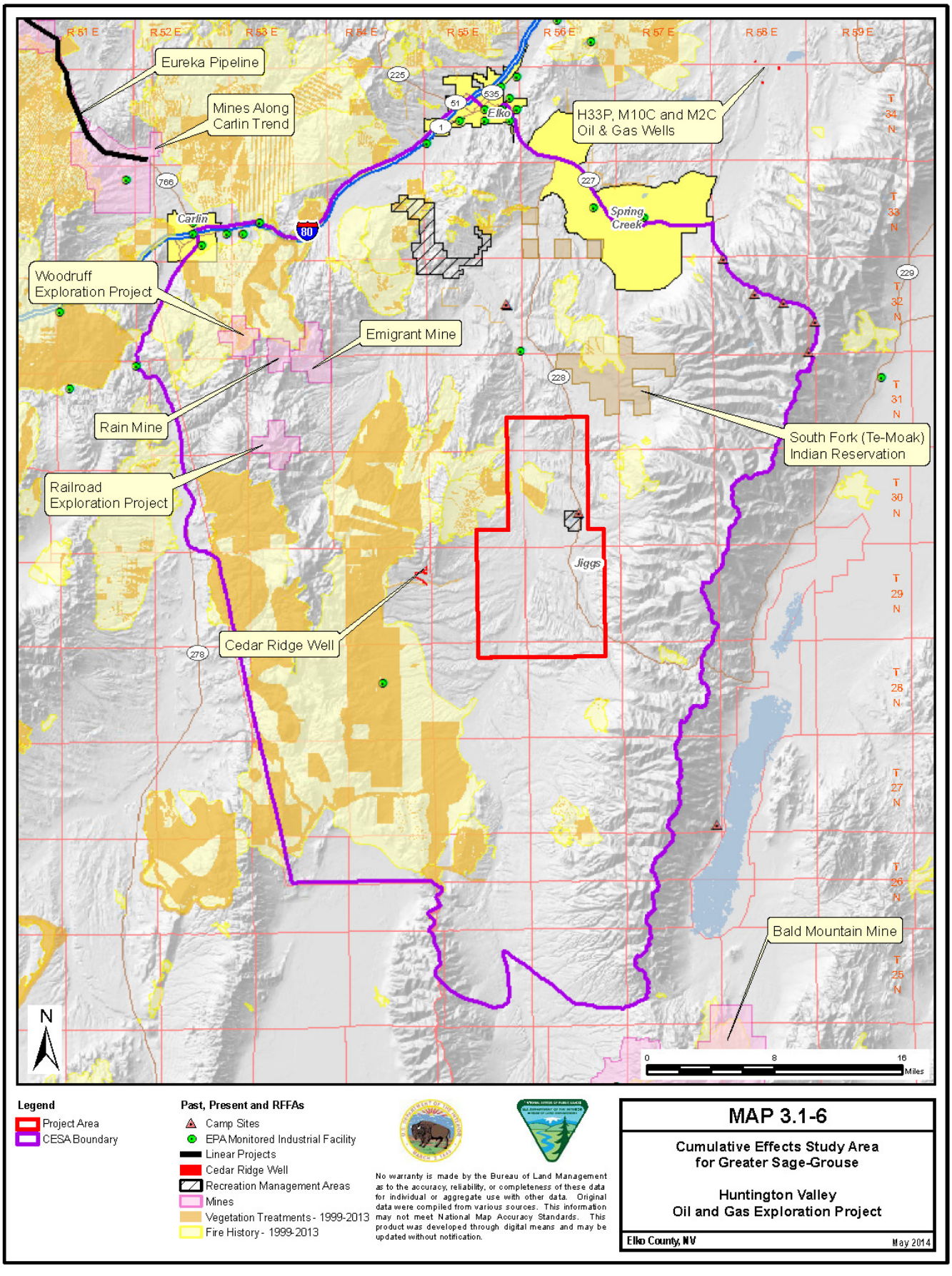
Past, Present and RFFAs

- Camp Sites
- EPA Monitored Industrial Facility
- Linear Projects
- Cedar Ridge Well
- Recreation Management Areas
- Mines
- Vegetation Treatments - 1999-2013
- Fire History - 1999-2013

MAP 3.1-5

Cumulative Effects Study Area
Native American Concerns; Hydrology; Invasive/Non-Native Species; Soils; Migratory Birds; Special Status Species; Wildife/Fisheries, and Vegetation
Huntington Valley Oil and Gas Exploration Project

Elko County, NV — May 2014



Legend

- Project Area
- CESA Boundary

Past, Present and RFFAs

- Camp Sites
- EPA Monitored Industrial Facility
- Linear Projects
- Cedar Ridge Well
- Recreation Management Areas
- Mines
- Vegetation Treatments - 1999-2013
- Fire History - 1999-2013

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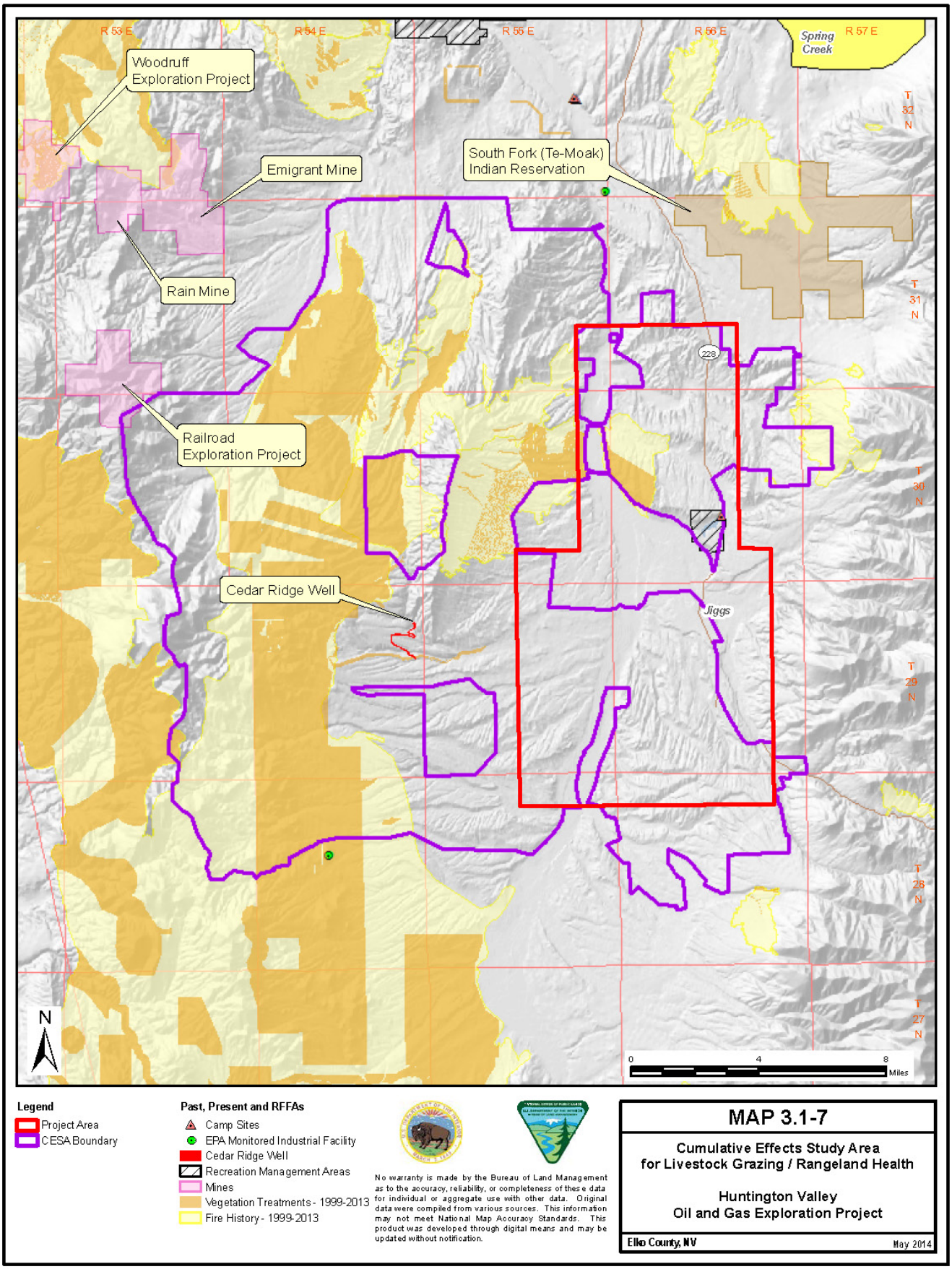
MAP 3.1-6

Cumulative Effects Study Area for Greater Sage-Grouse

Huntington Valley Oil and Gas Exploration Project

Elko County, NV — May 2014



Legend

- Project Area
- CESA Boundary

Past, Present and RFFAs

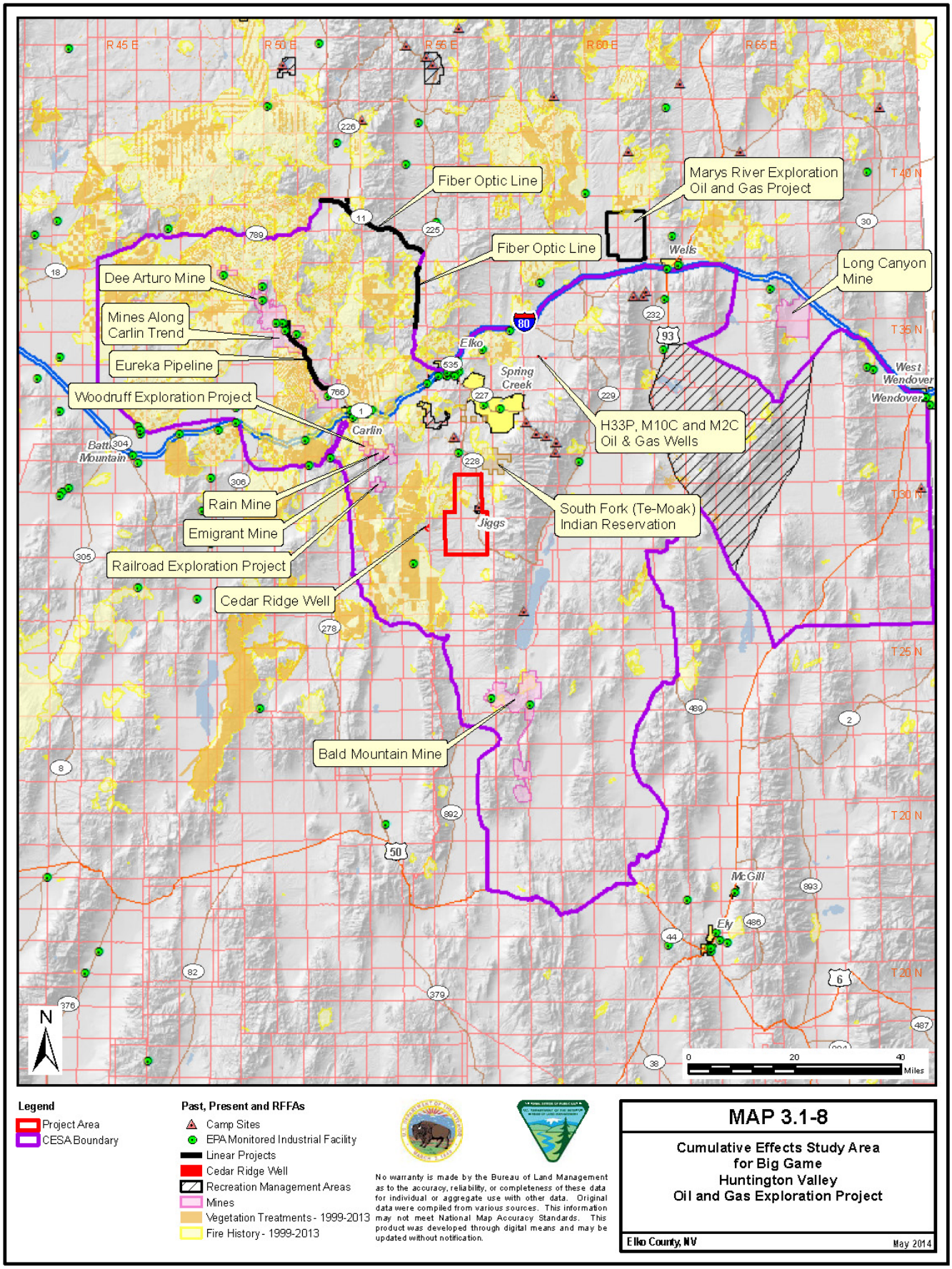
- Camp Sites
- EPA Monitored Industrial Facility
- Cedar Ridge Well
- Recreation Management Areas
- Mines
- Vegetation Treatments - 1999-2013
- Fire History - 1999-2013

MAP 3.1-7

Cumulative Effects Study Area for Livestock Grazing / Rangeland Health

Huntington Valley Oil and Gas Exploration Project

Elko County, NV — May 2014



Legend

- Project Area
- CESA Boundary

Past, Present and RFFAs

- Camp Sites
- EPA Monitored Industrial Facility
- Linear Projects
- Cedar Ridge Well
- Recreation Management Areas
- Mines
- Vegetation Treatments - 1999-2013
- Fire History - 1999-2013

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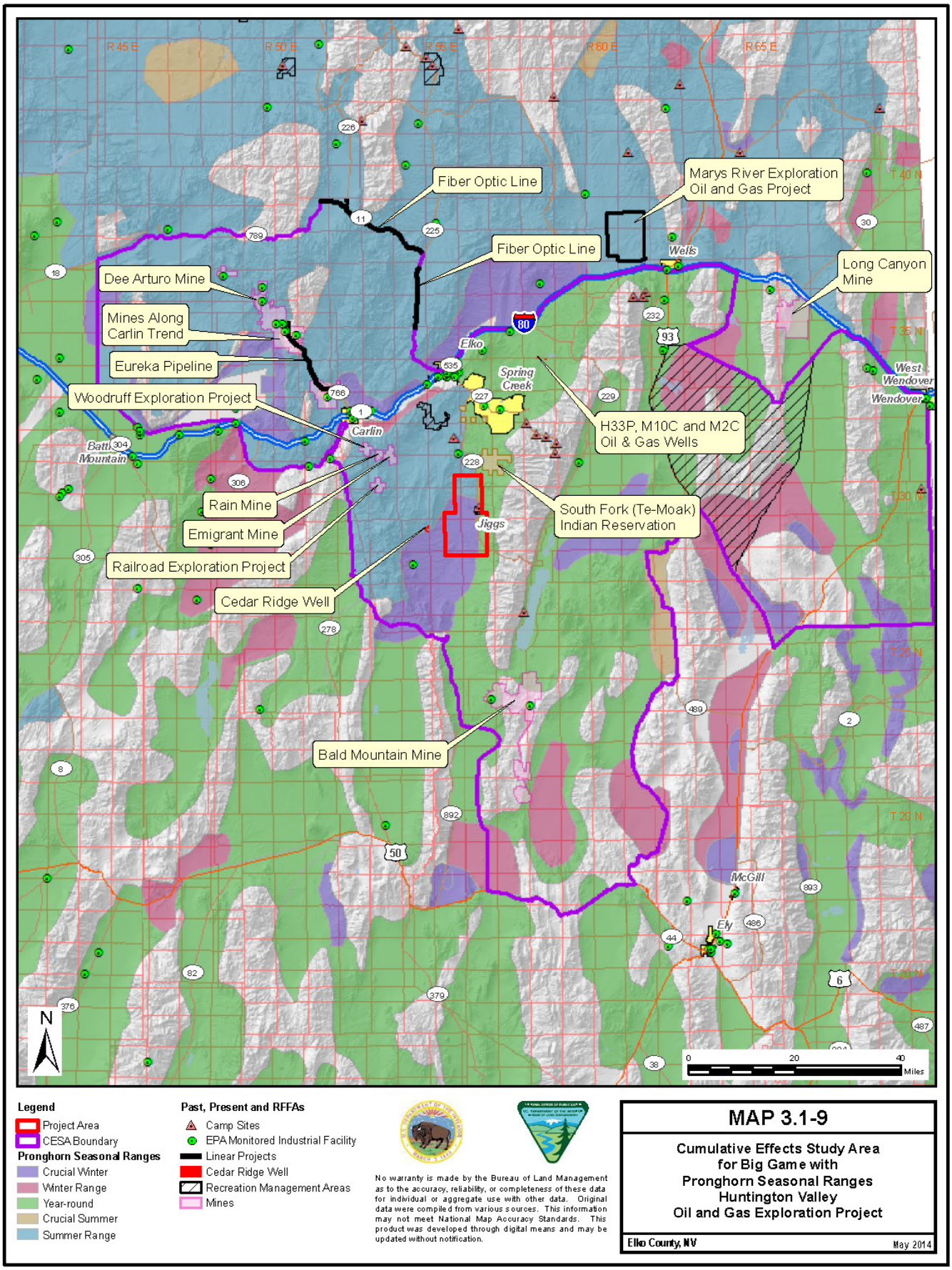
MAP 3.1-8

Cumulative Effects Study Area for Big Game Huntington Valley Oil and Gas Exploration Project

Elko County, NV — May 2014



Legend

- Project Area
- CESA Boundary

Pronghorn Seasonal Ranges

- Crucial Winter
- Winter Range
- Year-round
- Crucial Summer
- Summer Range

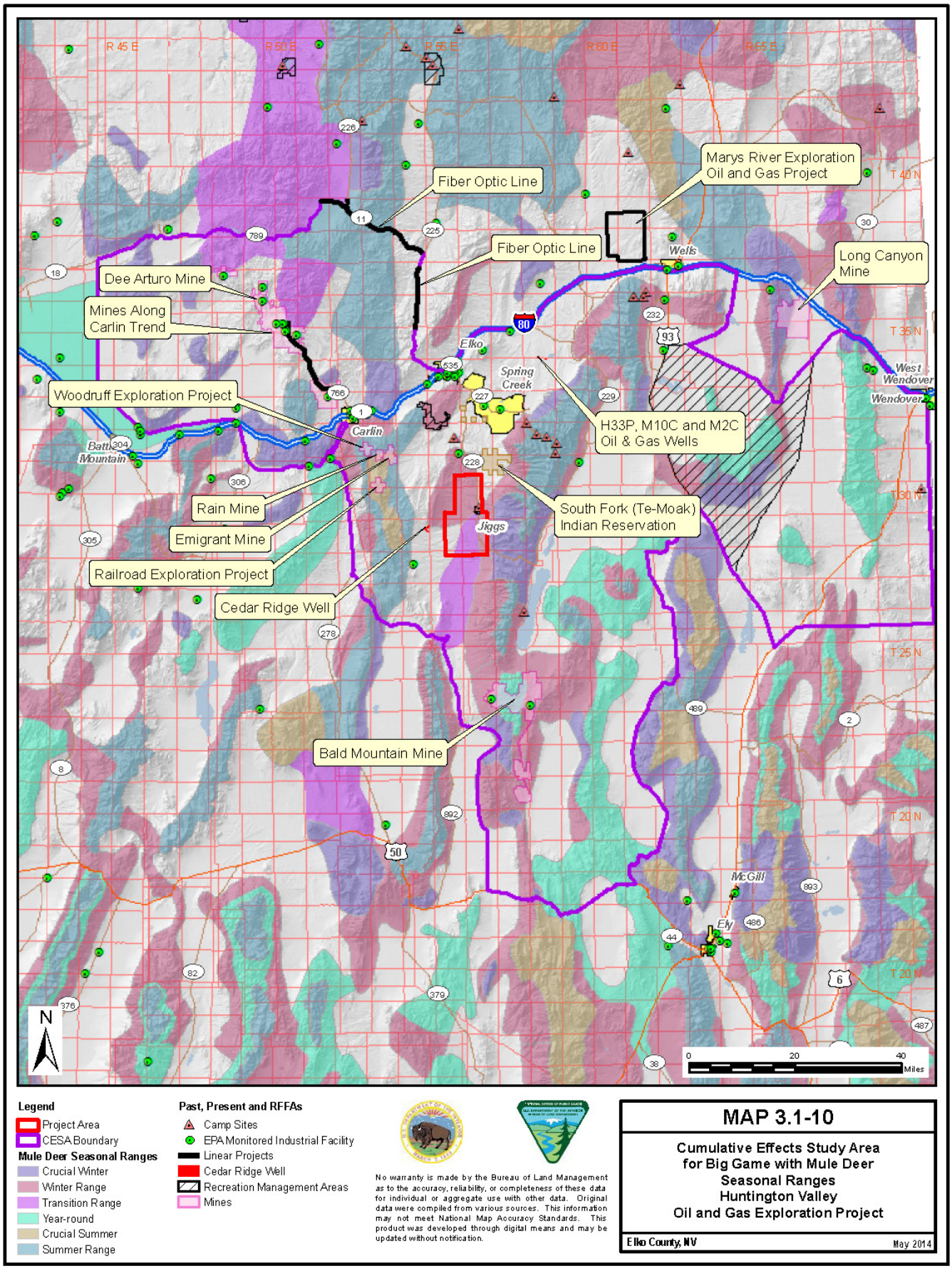
Past, Present and RFFAs

- Camp Sites
- EPA Monitored Industrial Facility
- Linear Projects
- Cedar Ridge Well
- Recreation Management Areas
- Mines

MAP 3.1-9

Cumulative Effects Study Area for Big Game with Pronghorn Seasonal Ranges Huntington Valley Oil and Gas Exploration Project

Elko County, NV — May 2014



Legend

- Project Area
- CESA Boundary

Mule Deer Seasonal Ranges

- Crucial Winter
- Winter Range
- Transition Range
- Year-round
- Crucial Summer
- Summer Range

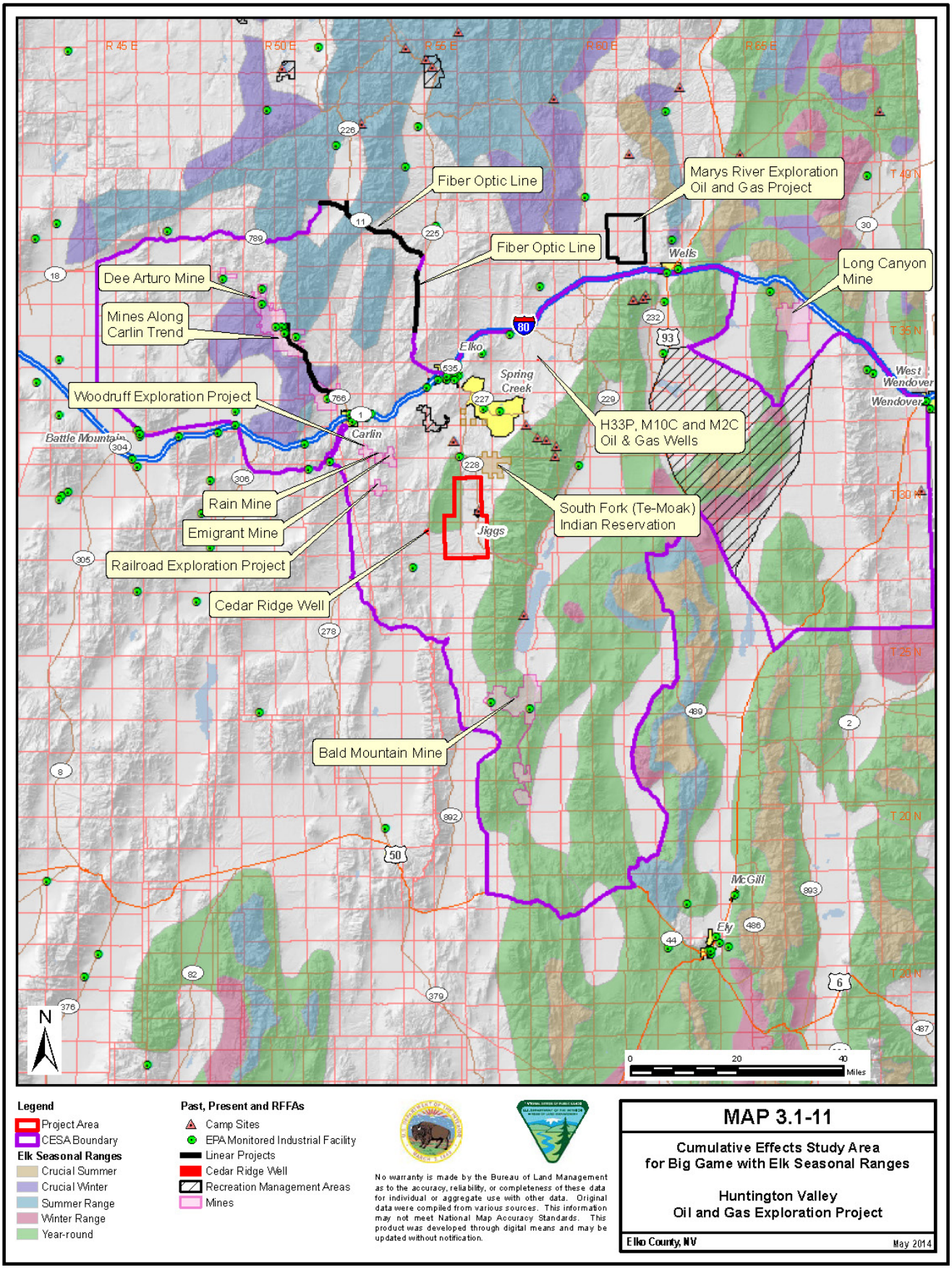
Past, Present and RFFAs

- Camp Sites
- EPA Monitored Industrial Facility
- Linear Projects
- Cedar Ridge Well
- Recreation Management Areas
- Mines

MAP 3.1-10

Cumulative Effects Study Area for Big Game with Mule Deer Seasonal Ranges Huntington Valley Oil and Gas Exploration Project

Elko County, NV — May 2014



Legend

- Project Area
- CESA Boundary

Elk Seasonal Ranges

- Crucial Summer
- Crucial Winter
- Summer Range
- Winter Range
- Year-round

Past, Present and RFFAs

- Camp Sites
- EPA Monitored Industrial Facility
- Linear Projects
- Cedar Ridge Well
- Recreation Management Areas
- Mines

MAP 3.1-11

Cumulative Effects Study Area for Big Game with Elk Seasonal Ranges

Huntington Valley Oil and Gas Exploration Project

Elko County, NV — May 2014

3.2 PHYSICAL RESOURCES

3.2.1 AIR QUALITY AND CLIMATE

3.2.1.1 Affected Environment

Regional air quality is influenced by a combination of factors including climate, meteorology, the magnitude and spatial distribution of local and regional air pollution sources, and the chemical properties of emitted pollutants. Within the lower atmosphere, regional and local scale air masses interact with regional topography to influence atmospheric dispersion and transport of pollutants. The following sections summarize the climatic conditions and existing air quality within the Project Area and surrounding region.

3.2.1.1.1 Regional Climate

The Project Area is located in Elko County, west of the Ruby Mountains and the Humboldt-Toiyabe National Forest. The climate is arid and characterized by warm, dry summers and cold, wet winters. The nearest long-term meteorological measurements were collected at Jiggs, Nevada (1948-1972) and Jiggs 8 SSE, Nevada (1978-2005). The sites are located within the Project Area approximately 4 miles apart, at elevations of 5,420 and 5,760 feet above mean sea level - amsl (Western Regional Climate Center – WRCC, 2014).

The annual average total precipitation at Jiggs is 12.58 inches, with annual totals ranging from 6.74 inches (1954) to 25.47 inches (1983). Precipitation is greatest in the winter and spring. Average monthly precipitation ranges from 0.42 inches (July) to 1.83 inches (May). An average of 52 inches of snow falls during the year (annual high 102.8 inches in 1971), with the majority of the snow distributed evenly between December and March.

The region has cool temperatures, with average temperature (in degrees Fahrenheit - ˚F) ranging between 12.2˚F and 38.3˚F in January to between 45.1˚F and 87.3˚F in July. Extreme temperatures have ranged from -30˚F (1962) to 102˚F (1959). The frost free period generally occurs from June to August. Table 3.2-1 shows the mean monthly temperature ranges and total precipitation amounts.

Table 3.2-1
Mean Monthly Temperature Ranges and Total Precipitation Amounts, Jiggs Nevada (1948-2006)[1]

Month	Average Temperature Range (^{o}F)	Total Precipitation (inches)
January	10.7 – 39.4	1.18
February	15.3 – 42.8	0.99
March	18.6 – 50.3	1.30
April	25.2 – 58.4	1.48
May	32.9 – 67.7	1.83
June	39.3 – 76.9	1.01
July	43.1 – 89.2	0.42
August	40.8 – 87.0	0.57
September	31.7 – 77.7	0.75
October	23.0 – 66.8	0.81
November	18.7 – 50.7	1.11
December	10.7 – 39.1	1.17
Annual	**44.2 (average)**	**12.58 (average)**

[1] WRCC, 2014.

The closest comprehensive wind measurements are collected 21 miles north of the Project Area at the Elko, Nevada National Weather Service (NWS) meteorological monitoring station (NDEP, 2013a). Winds within the Project Area would be affected by local topographic features; however, to describe the wind flow pattern for the region, a wind rose for Elko for available years 2007 through 2010 is presented in Figure 3.2-1. From this information, it is evident that the winds originate from the south to southwest approximately 44 percent of the time.

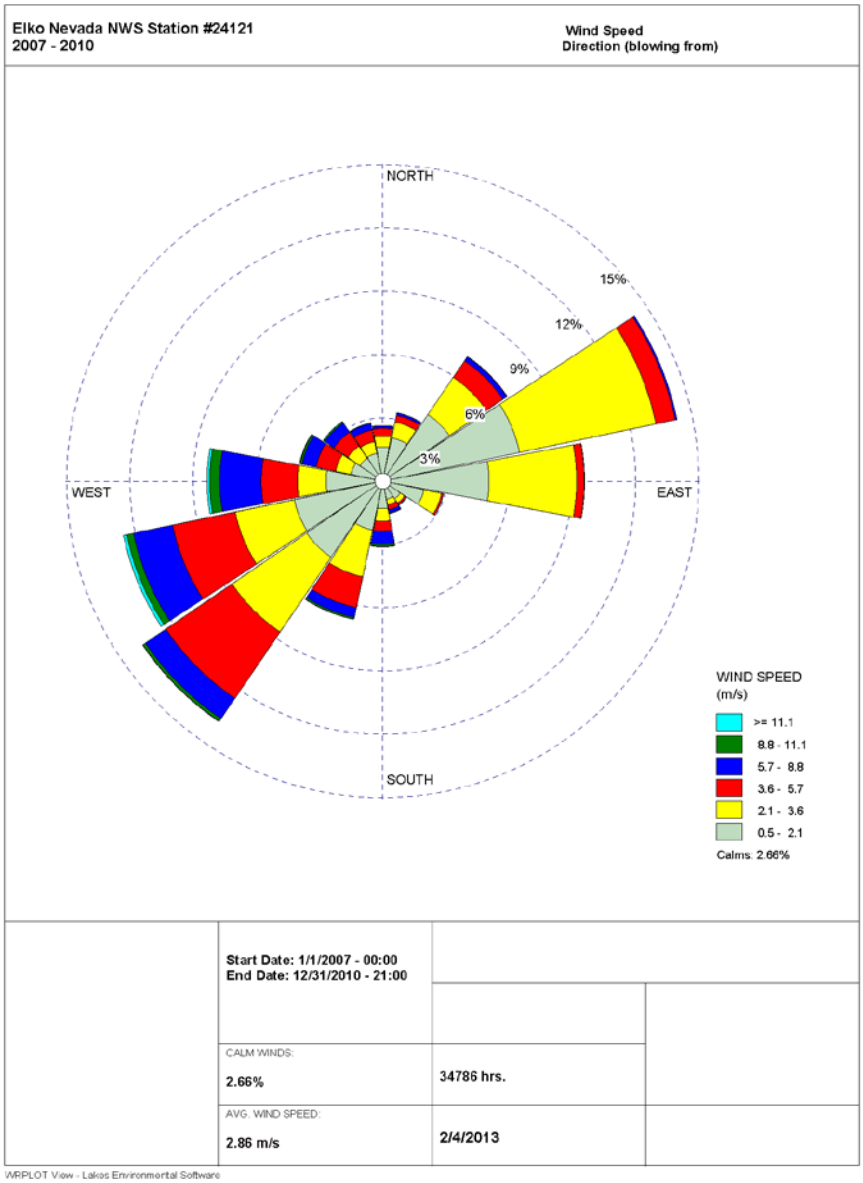


Figure 3.2-1
Elko NWS Meteorological Data Wind Rose, Elko County, Nevada

The frequency and strength of winds greatly affect the transport and dispersion of air pollutants. The annual mean wind speed is 6.4 miles per hour (mph), a moderate wind speed indicating the presence of good dispersion and mixing of any potential pollutant emissions resulting from project sources (see Tables 3.2-2 and 3.2-3).

Table 3.2-2
Wind Speed Distribution, Elko, Nevada, 2007 through 2010[1]

Wind Speed (m/sec)	Frequency (%)
0 – 2.1	41.80
2.1 – 3.6	28.68
3.6 - 5.7	16.01
5.7 – 8.8	8.31
8.8 – 11.1	1.39
Greater than 11.1	0.37

[1] NDEP, 2013a.

Table 3.2-3
Wind Direction Frequency Distribution, Elko, Nevada, 2007 through 2010[1]

Wind Direction	Frequency (%)
N	2.61
NNE	3.27
NE	7.06
ENE	14.12
E	9.47
ESE	2.92
SE	1.35
SSE	1.56
S	3.09
SSW	6.62
SW	13.65
WSW	12.43
W	8.25
WNW	3.99
NW	3.37
NNW	2.79

[1] NDEP, 2013a.

3.2.1.1.2 Air Pollutant Concentrations

The EPA and states set limits on permissible concentrations of air pollutants. The National Ambient Air Quality Standards (NAAQS) and Nevada Ambient Air Quality Standards (Nevada AAQS) are health-based criteria for the maximum acceptable concentrations of air pollutants at all locations to which the public has access.

Monitoring of air pollutant concentrations has been conducted in the region. These monitoring sites are part of several monitoring networks overseen by state and federal agencies, including: NDEP-Bureau of Air Quality Planning (BAQP) Clean Air Status and Trends Network (CASTNET), Interagency Monitoring of Protected Visual Environments (IMPROVE), and National Acid Deposition Program (NADP) National Trends Network (NTN).

One Prevention of Significant Deterioration (PSD) Class I area is located within 200 kilometers (km) of the Project Area. The Jarbidge Wilderness Area, designated PSD Class I, is located 43.1 km (26.8 miles) north of the Project Area, as shown on Map 3.2-1.

Air pollutants monitored in the region include carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter less than 10 microns in effective diameter (PM_{10}), particulate matter less than 2.5 microns in effective diameter ($PM_{2.5}$), and sulfur dioxide (SO_2). Background concentrations of these pollutants define ambient air concentrations in the region and establish existing compliance with ambient air quality standards. The most representative monitored regional background concentrations available for criteria pollutants as identified by NDEP are shown in Table 3.2-4 (NDEP, 2013b). Note that NO_2 and SO_2 are not reported because they are not monitored in Nevada by NDEP.

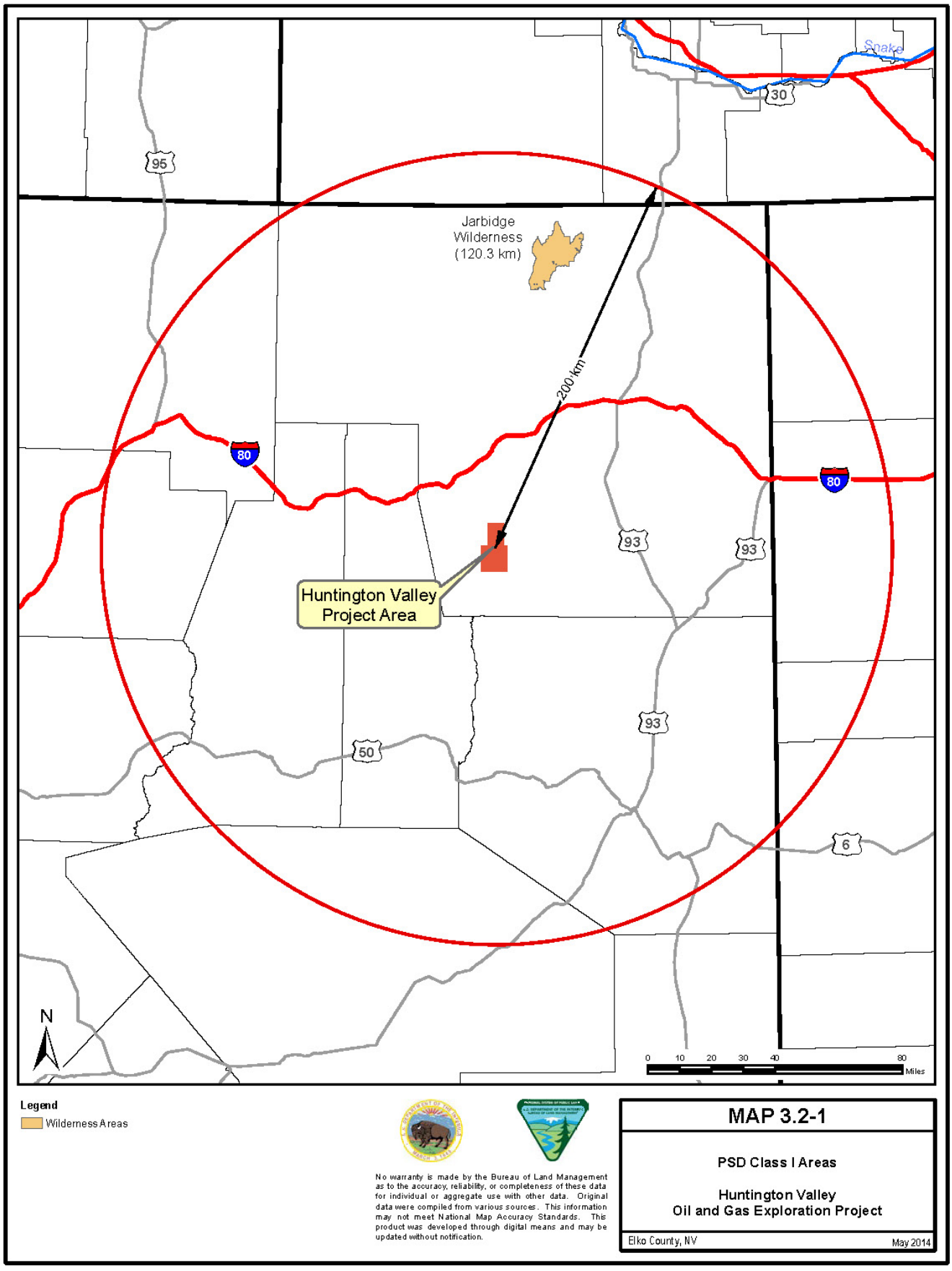
Table 3.2-4
Background Ambient Air Quality Concentrations
(micrograms per cubic meter - µg/m^3)

Pollutant	Averaging Period	Measured Background Concentration
CO[1]	1-hour	6,670
	8-hour	3,680
O_3[2]	8-hour	137
PM_{10}[3]	24-hour	124
$PM_{2.5}$[4]	24-hour	15.2
	Annual	4.78

[1] Harvey's Resort Hotel, Stateline, Nevada. 2009-2011, NDEP.
[2] Great Basin National Park. 2009-2011, NDEP.
[3] Elko Grammar School #2, Elko, Nevada. 2011, NDEP.
[4] Fernley Intermediate School, Fernley, Nevada. 2009-2011, NDEP.

3.2.1.1.3 Overview of Regulatory Environment

Federal air quality regulations adopted and enforced by NDEP-Bureau of Air Pollution Control (BAPC) limit incremental emission increases to specific levels defined by the classification of air quality in an area. The PSD program is designed to limit the incremental increase of specific air pollutant concentrations above a legally defined baseline level. Incremental increases in PSD Class I areas are strictly limited, while increases allowed in Class II areas are less strict. Through the PSD program, Class I areas are protected by Federal Land Managers (FLMs) by management of air quality related values (AQRVs) such as visibility, aquatic ecosystems, flora, fauna, etc.



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MAP 3.2-1

PSD Class I Areas

Huntington Valley
Oil and Gas Exploration Project

Elko County, NV — May 2014

The 1977 Clean Air Act amendments established visibility as an AQRV that FLMs must consider. The 1990 Clean Air Act amendments contain a goal of improving visibility within PSD Class I areas. The Regional Haze Rule finalized in 1999 requires the states, in coordination with federal agencies and other interested parties, to develop and implement air quality protection plans to reduce the pollution that causes visibility impairment.

Regulations and standards which limit permissible levels of air pollutant concentrations and air emissions and are relevant to the project air impact analysis include:

- NAAQS and Nevada AAQS;
- Prevention of Significant Deterioration;
- New Source Performance Standards (NSPS); and
- Non-Road Engine Tier Standards.

Each of these regulations is further described in the following sections.

Ambient Air Quality Standards

The Clean Air Act requires the EPA to set NAAQS for pollutants considered to endanger public health and the environment. The NAAQS prescribe limits on ambient levels of these pollutants in order to protect public health, including the health of sensitive groups. The EPA has developed NAAQS for six criteria pollutants: NO_2, CO, SO_2, PM_{10}, $PM_{2.5}$, O_3, and lead. Lead emissions from project sources are negligible (because leaded fuel is not used) and therefore, the lead NAAQS is not addressed in this analysis. States typically adopt the NAAQS but may also develop state-specific ambient air quality standards for certain pollutants. The NAAQS and the state ambient air quality standards for Nevada are summarized in Table 3.2-5. PSD Class I and Class II increments are also included in Table 3.2-5 and a discussion of PSD increments is provided in Section 3.1.3.3.

NDEP air quality basins for which attainment status is defined are generally the same as the Hydrographic Basins. The Project Area is located within the Huntington Valley and South Fork Area air quality basins. This area is designated by the EPA as “unclassified” per NAAQS as set forth in 40 CFR 81.329. An unclassified area is one for which no ambient air quality data are available and the ambient concentrations could be above or below the ambient air quality standards; however, unclassified areas are managed as in attainment. The Project Area is classified as PSD Class II, pursuant to PSD regulations promulgated under the Clean Air Act.

The Project Area is treated as an area “in attainment” with ambient air quality standards. Therefore, new sources within this basin must evaluate their impacts to air quality with respect to the ambient standards. The major source of fugitive dust in the vicinity of the Project Area includes vehicular traffic on unpaved roads and windblown dust.

Hazardous Air Pollutants

Toxic air pollutants, also known as hazardous air pollutants (HAPs), are pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. For this Project, HAPs include benzene, ethylbenzene, toluene, xylene, n-hexane, and formaldehyde. No ambient air quality standards exist for HAPs; instead emissions of these pollutants are regulated by a variety of regulations that target the specific source class and industrial sectors for stationary, mobile, and product use/formulations.

Table 3.2-5
Ambient Air Quality Standards and PSD Increments (µg m^3)

Pollutant/Averaging Time	NAAQS	Nevada AAQS	PSD Class I Increment[1]	PSD Class II Increment[2]
CO				
1-hour[2]	40,000	40,000	--[3]	--[3]
8-hour (less than 5,000 ft. amsl)[2]	10,000	10,000	--	--
8-hour (greater than 5,000 ft. amsl)[2]	7,000	--	--	--
NO_2				
1-hour[8]	188	188	--	--
Annual[4]	100	100	2.5	2.5
O_3				
1-hour	--[5]	235	--	--
8-hour[6]	147	147	--[3]	--[3]
PM_{10}				
24-hour[2]	150	150	8	30
Annual[4]	--[5]	50	4	17
$PM_{2.5}$				
24-hour[7]	35	35	2	9
Annual (Primary)[4]	12	12	1	4
Annual (Secondary)[4]	15	15	--	--
SO_2				
1-hour[9]	196	196	--	--
3-hour[2]	1,300	700	25	512
24-hour[2]	--[5]	365	5	91
Annual	--[5]	80	2	20

[1] The PSD demonstrations serve information purposes only and do not constitute a regulatory PSD increment consumption analysis.
[2] No more than one exceedance per year.
[3] No PSD increments have been established for this pollutant.
[4] Annual arithmetic mean.
[5] The NAAQS for this averaging time for this pollutant has been revoked by EPA.
[6] An area is in compliance with the standard if the fourth-highest daily maximum 8-hour ozone concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.
[7] An area is in compliance with the standard if the highest 24-hour PM2.5 concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.
[8] An area is in compliance with the standard if the 98th percentile of daily maximum 1-hour NO_2 concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.
[9] An area is in compliance with the standard if the 99th percentile of daily maximum 1-hour SO_2 concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.

Prevention of Significant Deterioration

The PSD program is designed to limit the incremental increase of specific air pollutant concentrations above a legally defined baseline level. All areas of the country are assigned a classification which describes the degree of degradation to the existing air quality that is allowed to occur within the area under the PSD permitting rules. PSD Class I areas are areas of special national or regional natural, scenic, recreational, or historic value, and very little degradation in air quality is allowed by strictly limiting industrial growth. PSD Class II areas allow for reasonable industrial/economic expansion. Certain national parks and wilderness areas are designated as PSD Class I, and air quality in these areas is protected by allowing only slight incremental increases in pollutant concentrations.

New Source Performance Standards

Under Section 111 of the Clean Air Act, the EPA has promulgated technology-based emissions standards which apply to specific categories of stationary sources. These standards are referred to as New Source Performance Standards; 40 CFR Part 60. NSPS which may apply to the Proposed Action include 40 CFR Part 60 Subpart A – General Provisions, 40 CFR Part 60 Subpart Kb – Standards of Performance for Volatile Organic Storage Vessels, or other applicable subparts.

Non-Road Engine Tier Standards

The EPA sets emissions standards for non-road diesel engines for hydrocarbons, nitrogen oxides (NO_X), CO, and particulate matter. The emissions standards are implemented in tiers by year, with different standards and start years for various engine power ratings. The new standards do not apply to existing non-road equipment. Only equipment built after the start date for an engine category (1999-2006, depending on the category) is affected by the rule. Over the life of a project, the fleet of non-road equipment will turn over and higher-emitting engines will be replaced with lower-emitting engines.

Greenhouse Gases

In 2007 the U.S. Supreme Court ruled that the EPA has the authority to regulate greenhouse gases (GHGs) such as methane and carbon dioxide (CO_2) as air pollutants under the Clean Air Act. However, no ambient air quality standards for GHGs currently exist, nor are there currently any emissions limits on GHGs that would apply to sources developed under the Proposed Action. Both the exploration/construction and operations/production phases of the Proposed Action would cause emissions of GHGs. Methane comprises much of the chemical composition of natural gas, and nitrous oxide, CO_2, and methane are emitted during combustion of fossil fuels. As part of the development of the Proposed Action emission inventory, an inventory of CO_2, methane, and nitrous oxide was prepared for informational purposes.

3.2.1.2 Environmental Effects

3.2.1.2.1 Proposed Action Alternative

The Proposed Action would produce emissions of air pollutants from stationary and mobile sources. Air pollutant emissions have the potential to increase air quality concentrations and affect public health in the vicinity of the Project Area. An inventory of air emissions was prepared to estimate total air pollutant emissions expected to result from project construction and operations.

The majority of PM_{10} and $PM_{2.5}$ emissions in the Project Area are attributed to fugitive dust sources, defined as those not able to be captured and routed to a control device. These fugitive sources include construction activities, equipment and vehicles travelling on unpaved roads, and windblown disturbance.

Emissions of the criteria pollutants NO_x, CO, and volatile organic compounds (VOCs) occur primarily from fuel combustion sources including engines, heaters, heavy equipment, and mobile sources (heavy and light-duty vehicles) operating during the construction and operations phases of the Proposed Action. VOC emissions are also produced from oil and water tanks that would be located at each well pad.

Small quantities of HAP emissions would also occur from well completion and fuel combustion (flaring, engine use).

Impact Significance Criteria

Air quality impacts from pollutant emissions are limited by regulations, standards, and implementation plans established under the Clean Air Act, as administered by the NDEP-BAPC under authorization of the EPA. Under FLPMA and the Clean Air Act, the BLM cannot conduct or authorize any activity which does not conform to all applicable local, state, tribal or federal air quality laws, statutes, regulations, standards, or implementation plans. As such, significant impacts to air quality from project-related activities would result if it is demonstrated that:

- NAAQS or Nevada AAQS would be exceeded; or
- AQRVs would be impacted beyond acceptable levels.

All NEPA analysis comparisons to the PSD Class I and II increments are intended to evaluate a threshold of concern, and do not represent a regulatory PSD Increment Consumption Analysis. The determination of PSD increment consumption is an air quality regulatory agency responsibility. Such an analysis would be conducted to determine minor source increment consumption or, for major sources, as part of the New Source Review process. The New Source Review process would also include an evaluation of potential impacts to AQRVs such as visibility, aquatic ecosystems, flora, fauna, etc. performed under the direction of the FLMs.

Emissions Inventory Development

Construction/Drilling Phase emissions sources include vehicle traffic, well pad and road construction, well drilling, and well completion. The primary pollutants emitted during construction would be PM_{10}, $PM_{2.5}$, NO_x, CO, SO_2, and VOCs. Construction would temporarily elevate pollutant levels, but impacts would be localized and would occur only for the short-term duration of construction at each well pad. Fugitive dust emissions (PM_{10} and $PM_{2.5}$) during the construction phase would result from work crews travelling to and from the Project Area and from the transport and operation of equipment. Wind-blown fugitive dust emissions would also occur from open and disturbed land during construction.

During the Production/Operations Phase, air emissions would occur from vehicle traffic on roads during routine field operations and maintenance, wind erosion of unreclaimed acres, and equipment at each well pad including oil and water tanks, a diesel generator, pump engine, line heater, and flare. The primary pollutants emitted would be PM_{10}, $PM_{2.5}$, NO_x, CO, SO_2, and VOCs.

Particulate Matter (PM). Emissions of particulate matter (dust) would occur primarily due to movement of soils during construction and also from the earth moving machinery such as bulldozers, loader, and compactors. Additional sources of dust are wind erosion, vehicle traffic on dirt roads, and diesel generators and pump units utilized during production.

Project Design Features for dust control include graveling the road surfaces, speed control, and applying dust suppression agents such as water or chemical binding agents. The use of water trucks would focus on the areas of main travel and activity.

The NDEP-BAPC regulates particulate matter emissions from construction projects disturbing areas greater than 5 acres. A Surface Area Disturbance (SAD) application would be submitted for approval to the NDEP-BAPC. The SAD permit application would include a dust control plan as well.

Sulfur Oxides (SO_X). Sulfur oxides are produced by the combustion of sulfur in a fuel source. This includes heavy equipment and other vehicles using diesel as fuel. Low sulfur diesel, which has a lower sulfur content than historical formulations, would be used. The emissions of SO_X from heavy construction equipment were calculated using EPA's AP-42 emission factors for

mobile sources. The factors use a conservative fuel sulfur content compared to available diesel fuel used presently (500 parts per million - ppm or 15 ppm for ultra-low sulfur fuels). Sulfur is not expected to be encountered in the field gas produced from the well. If it is determined that the produced gas contains sulfur, the impacts would be analyzed and communicated to the BLM office.

Nitrogen Oxides (NO_X) and Carbon Monoxide (CO). NO_X and CO are products of incomplete combustion. Sources of combustion from this project include internal combustion engines and natural gas flaring. Several different types of equipment using engines would be used, including work trucks, construction equipment (bulldozers, scrapers, etc.), drilling rigs, electrical generators, equipment hauling vehicles, and produced oil and water transportation trucks. Many newer gasoline and diesel engines used in on-road vehicles incorporate catalytic converters to reduce emissions of NO_X and CO. Off-road diesel engines used on drilling rigs should conform to EPA standards for emissions (Tier 1 through Tier 4) depending on their year of manufacture. Drilling rig engines were estimated using Tier 2 voluntary standards. However, newer, cleaner diesel engines would be used if available at the time of rig scheduling. Generators utilized at each water well location during construction would be Tier 4 compliant.

Volatile Organic Compounds (VOCs). Emissions of VOCs are produced when hydrocarbons vaporize into the atmosphere. This can be done in several different ways such as incomplete combustion of hydrocarbons and direct venting of gas. Direct venting of gas could take place during well completion when fluids are allowed to return to the surface along with gas that may not be of high enough heating value to burn in a flare. Direct venting can also occur when hydrocarbons are stored in tanks. As the hydrocarbon liquid enters the tank it displaces the same volume of vapors from the tank. In addition, heating by direct sunlight vaporizes a small portion of the hydrocarbon which will then vent from the tank. Both streams of vapors, from well completion and tank venting, will be controlled using a combustion device. These combustion devices may be enclosed to reduce the amount of light observed or open flame, depending on the amount of gas to be controlled. The recently signed (not finalized) federal NSPS for Oil and Gas is intended to reduce emissions of VOCs from these types of sources. While combustion of gas is a proven method to reduce VOC emissions, it only results in destruction efficiencies of around 95 percent to 98 percent.

Hazardous Air Pollutants (HAPs). HAPs are released to the atmosphere during well completion, and result from fossil fuel combustion in drilling and completion engines and pumps utilized during the Construction/Drilling Phase. During the Production/Operations Phase, generators, pumps, heaters, and flares emit HAPs. On- and off-road mobile sources were considered negligible sources of HAPs. Total HAP emissions during an annual maximum development scenario (16 wells constructed, 16 wells drilled, 16 annual completions, 8 water wells, and 4 wells in production) were computed and found to be less than 1 ton per year each for the HAPs benzene, toluene, ethylbenzene, xylene, and n-hexane. Formaldehyde emissions totaled 2.16 tons per year.

Pollutant emissions from the Construction/Drilling Phase were quantified using accepted methodologies, including EPA emission factors and engineering estimates. Drill rig engines, completion engines, and water well generator engines are estimated the appropriate EPA Tier emissions standard. Pollutant emissions from construction of a single well pad and well are shown in Table 3.2-6. Maximum annual field-wide emissions during the Construction/Drilling Phase are shown in Table 3.2-7, and assume that in one year a maximum of 16 well pads are constructed, 16 wells are drilled and completed, 8 water wells are drilled and operated, and 4 wells are in production.

Table 3.2-6
Emissions (1 Well and Pad) during the Construction/Drilling Phase

Activity	Tons Per Year					
	PM_{10}	$PM_{2.5}$	NO_X	CO	SO_2	VOC
Well Pad and Road Construction	0.16	0.07	0.14	0.05	0.01	0.01
Rig-Up and Drilling	3.87	0.47	3.30	3.57	0.00	0.41
Completion	8.95	0.89	0.54	0.83	0.01	0.25
Water Well and Misc. Traffic	3.54	0.35	0.10	0.12	0.00	0.01
Maximum Annual Emissions	**16.52**	**1.78**	**4.08**	**4.57**	**0.02**	**0.68**

Table 3.2-7
Emissions (16 Wells and Pads) during the Construction/Drilling Phase

Activity	Tons Per Year					
	PM_{10}	$PM_{2.5}$	NO_X	CO	SO_2	VOC
Well Pad and Road Construction	2.63	1.17	2.20	0.74	0.23	0.22
Rig-Up and Drilling	61.98	7.57	52.88	57.07	0.04	6.49
Completion	143.15	14.31	8.66	13.34	0.09	3.96
Water Well and Misc. Traffic	54.45	5.4	0.82	0.96	0.00	0.06
Maximum Annual Emissions	**262.21**	**28.45**	**64.56**	**72.11**	**0.36**	**10.73**

Maximum annual emissions calculated for the Production/Operations Phase for one well are summarized in Table 3.2-8. Table 3.2-9 summarizes maximum annual emissions for the field in full production during the Production/Operations Phase, with 20 wells operating simultaneously.

Table 3.2-8
Annual Emissions (One Well) during Production/Operations Phase

Activity	Tons Per Year					
	PM_{10}	$PM_{2.5}$	NO_X	CO	SO_2	VOC
Oil Tanks	--	--	--	--	--	17.11
Water Tanks	--	--	--	--	--	0.02
Diesel Generator	0.42	0.42	0.72	0.63	--	0.24
Pumping Unit	0.11	0.11	0.48	0.96	--	0.24
Line Heater	--	--	0.73	0.61	--	0.04
Flare	--	--	3.60	3.02	--	0.20
Truck Loading	--	--	--	--	--	2.58
Production Traffic	6.62	0.66	0.11	0.09	0.00	0.01
Wind Erosion	0.16	0.02	--	--	--	--
Total Production Emissions	**7.31**	**1.21**	**5.64**	**5.31**	**0.00**	**20.44**

Table 3.2-9
Annual Emissions (20 Wells) during Production/Operations Phase

Activity	Tons Per Year					
	PM_{10}	$PM_{2.5}$	NO_X	CO	SO_2	VOC
Oil Tanks	--	--	--	--	--	342.19
Water Tanks	--	--	--	--	--	0.37
Diesel Generator	8.40	8.40	14.47	12.54	--	4.82
Pumping Unit	2.18	2.18	9.65	19.30	--	4.82
Line Heater	--	--	14.52	12.20	--	0.80
Flare	--	--	71.99	60.47	--	3.96
Truck Loading	--	--	--	--	--	51.61
Production Traffic	132.30	13.23	2.20	1.74	0.00	0.21
Wind Erosion	3.29	0.33	--	--	--	--
Total Production Emissions	**146.17**	**24.14**	**112.83**	**106.25**	**0.00**	**408.78**

Greenhouse Gases. As part of the development of the project emission inventory, an inventory of CO_2, methane (CH_4), and N_2O emissions from construction and operations was prepared. The GHG inventory is presented here for informational purposes and is compared to other state and U.S. GHG emission inventories in order to provide context for the project GHG emissions.

Emissions of these greenhouse gases are quantified in terms of CO_2 equivalents (CO_2e). Measuring emissions in terms of CO_2e allows for the comparison of emissions from different greenhouse gases based on their Global Warming Potential (GWP). GWP is defined as the cumulative radiative forcing of a gas over a specified time horizon relative to a reference gas resulting from the emission of a unit mass of gas. The reference gas is taken to be CO_2. The CO_2e emissions for a greenhouse gas are derived by multiplying the emissions of the gas by the associated GWP. The GWPs for the inventoried greenhouse gases are CO_2:1, CH_4:21, N_2O:310 (EPA, 2010). Greenhouse gas emissions for construction and production are shown in Table 3.2-10.

Table 3.2-10
Project GHG Emissions (metric tons per year)

Pollutant	Construction/Drilling[1]	Production/Operations[2]
CO_2	49,014	55,779
CH_4	1.480	6.540
N_2O	0.174	0.226
CO_2e	**49,099**	**55,986**

[1] Assumes 16 wells pads constructed and four producing wells.
[2] Assumes 20 wells in production.

By comparison, annual CO_2e emissions from the State of Nevada totaled 56,000,000 metric tons per year in 2005, and annual CO_2e emissions in the United States totaled 6,957,000,000 metric tons per year. Estimated CO_2e emissions from the Proposed Action shown in Table 3.2-10 comprise approximately 0.18 percent of total Nevada CO_2e emissions, and 0.00154 percent of U.S. CO_2e emissions.

Air Quality Impacts

Criteria Pollutant Impacts. Ambient air quality impacts associated with emissions during the Construction/Drilling Phase would be temporary in nature, persisting only during the short-term construction/drilling period at each well pad and at separate and distinct locations during field-wide construction. Ambient air quality impacts would be localized within the area immediately surrounding the fugitive or point emissions source, with concentrations reducing substantially with distance from the source. This is particularly evident for fugitive emissions sources, the

primary sources of PM_{10} and $PM_{2.5}$ in the field. Furthermore, the relatively low single-well NO_X emission rate shown in Table 3.2-6 indicates that a drilling rig would demonstrate compliance with the 1-hour NO_2 NAAQS and Nevada AAQS.

Total well site emissions from 20 wells during the Production/Operations Phase would be spatially separated, minimizing combined ambient air quality impacts from all wells. Both individual well emission rates and field-wide emission rates of NO_X and PM_{10}, the primary pollutants emitted, are at levels generally able to comply with ambient standards. As a result, production phase operations would be expected to comply with NAAQS and Nevada AAQS.

Single-well production emission rates are below the NDEP-BAPC modeling threshold of 25 tons per year (tpy) for any regulated pollutant, above which a facility must demonstrate ambient compliance through modeling (State of Nevada, 2014). This threshold applies to a single facility, which in the context of the Proposed Action is defined as a single well site. Note that the threshold is established as a guideline; NDEP-BAPC can request modeling for any facility regardless of emission levels, and would determine that need during the New Source Review permitting process.

Table 3.2-11 compares the Proposed Action's field-wide production emissions with the State of Nevada's total emissions and Elko County emissions in 2005. Based on this comparison, project-related emissions would add 0.04 percent to total state NO_X emissions and 1.7 percent to total county NO_X emissions, further suggesting the Proposed Action would not be significant on a state and county basis.

Table 3.2-11
Project Emissions Comparison – Production/Operations Phase

Pollutant	Project Annual Field-Wide Production [1] (tpy)	Nevada Total Emissions 2005 (tpy)	Elko County Total Emissions 2005 (tpy)
NO_X	112.83	255,553	6,452
CO	106.25	Not reported	Not reported
VOC	408.78	396,574	10,677
PM_{10}	135.59	Not reported	Not reported
$PM_{2.5}$	13.56	111,099	3,599
SO_X	0.00	147,798	767
[1] Calculated based on 20 wells.			

Climate Change Impacts. According to the BLM's Instruction Memorandum (IM) No. 2008-171, "Guidance on Incorporating Climate Change into Planning and NEPA Documents," dated August 19, 2008, climate change considerations should be acknowledged in EA documents. The IM states that ongoing scientific research has identified the potential impacts on global climate of anthropogenic (man-made) GHG emissions and changes in biological carbon sequestration due to land management activities. Through complex interactions on a regional and global scale, these GHG emissions and net losses of biological carbon sinks cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth back into space. Although GHG levels have varied for millennia, recent industrialization and burning of fossil carbon sources have caused CO_2e concentrations to increase dramatically, and are likely to contribute to overall global climatic changes. The Intergovernmental Panel on Climate Change recently concluded that "warming of the climate system is unequivocal" and "most of the observed increase in globally average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations."

Several activities contribute to the phenomena of climate change, including emissions of GHGs (especially CO_2 and methane) from fossil fuel development, large wildfires and activities using combustion engines; changes to the natural carbon cycle; and changes to radiative forces and reflectivity (albedo). It is important to note that GHGs could have a sustained climatic impact over different temporal scales. For example, recent emissions of CO_2 may influence climate for 100 years.

Current emissions within the vicinity of the Project Area include vehicle combustion emissions, fugitive dust from travel on unimproved roads, ranch activities, and wildland fires. Emissions of all pollutants are generally expected to be low due to the extremely limited number of sources in the vicinity of the Project Area. The CESA has been shown to include two industrial sources. The Carlin Trend mines are located outside of the air quality CESA, and are predominantly northwest of the CESA at a distance of 9 miles. Existing climate prediction models are global in nature; therefore they are not at the appropriate scale to estimate potential impacts of climate change within the Huntington Valley and South Fork Area air basins in which the Project Area is located. Due to the nature and scale of the Proposed Action, effects on climate change are not further analyzed in this EA.

Because the EPA has recently finalized (not yet published in the Federal Register) a comprehensive set of regulatory controls on oil and gas facilities, many activities would be subject to a specific list of requirements per the Oil & Gas NSPS, Subpart OOOO. In addition, the NDEP would require pre-construction operating permits for almost all well site equipment. Examples of these requirements include, but are not limited to the following:

- For atmospheric oil storage tanks at oil and gas exploration and production operations, VOC emissions of > 6 tpy are required to be reduced by 95 percent or greater.
- All continuous bleed pneumatic controllers placed in service on or after August 23, 2011, shall emit VOCs in an amount equal to or less than 6 standard cubic feet per hour.
- All condensate collection, storage, processing and handling operations, regardless of size, shall be designed, operated and maintained so as to minimize leakage of VOCs to the atmosphere to the maximum extent practicable.
- VOC combustion control devices shall be operated with no visible emissions greater than 5 minutes in any 2 hour period.
- Dust control and mitigation plans are required for SAD permits associated with projects disturbing over 5 acres.

Mitigation Measures

The BLM has not identified any mitigation measures in addition to the Project Design Features (see Section 2.2.1.6) to further reduce impacts to air quality.

3.2.1.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts associated with the Well Pad K2J Access Alternative would be similar to those described above for the Proposed Action Alternative. The additional 0.28 acre of surface disturbance would result in minimal additional impacts to air quality.

3.2.1.2.3 No Action Alternative

Under the No Action Alternative, there would be no impacts from either the Proposed Action Alternative or the Well Pad K2J Access Alternative to air quality or climate in the Project Area.

3.2.1.3 Cumulative Effects

The CESA for air quality is shown on Map 3.1-1. Air quality in the cumulative effects study area is affected by natural conditions such as fire, and blowing dust, along with a variety of anthropogenic effects such as blowing dust from soil disturbance, vehicle exhaust emissions, and emissions from industrial and domestic sources. Table 3.2-12 provides a summary of industrial sources of criteria air pollutants as given in EPA's 2011 National Emissions Inventory (EPA, 2014) which are located within the CESA.

Table 3.2-12
Industrial Emissions Sources within the CESA

Site Name	Facility Type	2011 NEI Emission Rate (tpy)					
		CO	NOx	SO2	VOC	PM10	PM2.5
Red Rock Ranch	Airport	0.00601	0.000032	0.000005	0.000075	0.000118	0.000082
Twin Bridges Rock Products	Sand and Gravel Mining	0.31	1.46	0.0957	0.12	0.15	0.12
Huntington Valley	Gold Mining and/or Processing	0.0923	0.16	0.00022	0.00985	0.0804	0.0468
Total Emissions by Pollutant (tpy)		**0.41**	**1.62**	**0.10**	**0.13**	**0.23**	**0.17**

Impacts from natural and anthropogenic emissions have not been high enough to classify affected basins and as a result, air quality is generally considered to be good. There are no cumulative impacts of concern for the No Action Alternative because air quality within the CESA is expected to continue to be good. The Proposed Action Alternative would incrementally increase pollutant emissions but these emissions are not expected to be significant enough to require classification of the basins. As a result, there are no substantive cumulative effects to air quality for the Proposed Action Alternative, Well Pad K2J Access Alternative, and No Action Alternative.

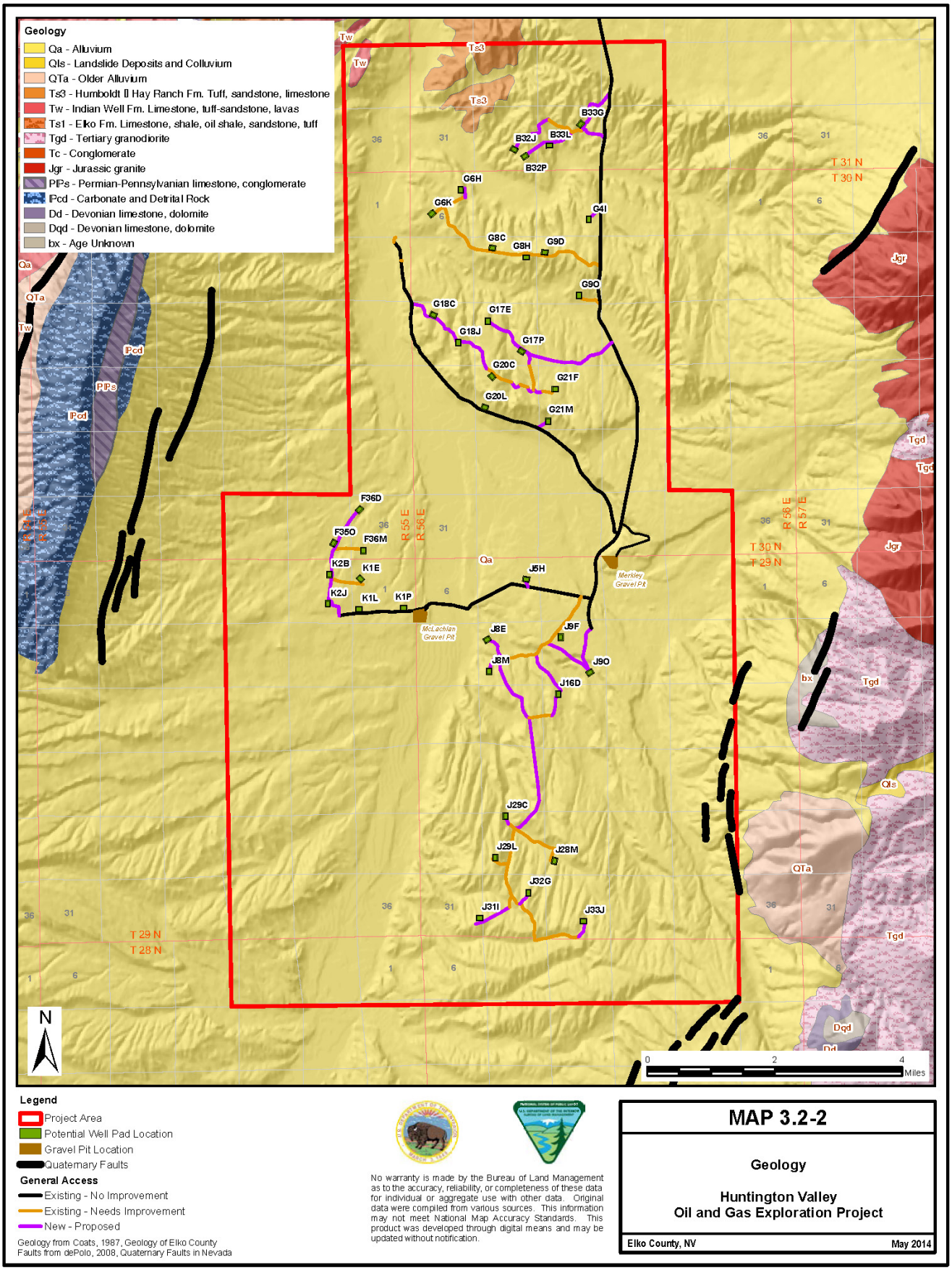
3.2.2 GEOLOGY AND MINERALS

3.2.2.1 Affected Environment

3.2.2.1.1 Geology

The Huntington Valley is a down-faulted, northerly trending block (graben) of Nevada's Basin and Range Province. The regional geology is described by Coats (1987) as shown on Map 3.2-2. The Ruby Mountains east of the valley consist of mostly granitoid intrusives of Mesozoic to Cenozoic age with relics of Paleozoic metasedimentary rocks. Fragmented ranges on the west side contain more Paleozoic carbonate rocks and an overlay of Tertiary volcanics (ash, welded tuff). Oil exploratory drilling in the late 1970s through the mid-1980s disclosed stratigraphy of the valley, consisting of up to 10,000 feet thickness of Tertiary through Recent deposits overlying mostly Paleozoic limestone basement. The lowest Tertiary unit is the Eocene-Oligocene Elko Formation, which is a lake-deposited marlstone with high kerogen content ("oil shale"), with high potential for generation of oil and gas hydrocarbons. This is overlain by up to 4,000 feet of Indian Well Formation, and up to 4,000 feet of the Hay Ranch Formation which is equivalent to the Humboldt Formation north of the valley. The Humboldt Formation outcrops in the north of the Project Area, but in the south it is overlain by up to 4,000 feet of Quaternary alluvium, undifferentiated (see Map 3.2-2). Hay Ranch and Indian Well formations both consist of tuffaceous volcanics, siltstone and sandstone, with conglomerate and lake-deposited limestone also present in the Indian Well Formation.

Fault traces shown on the geology map are Quaternary displacements mapped by dePolo (2008). These are just the surface expressions of features thousands of feet deep, which have thrown the Ruby Mountains up and Huntington Valley down. Faulting has occurred over the entire Tertiary, leading to thick accumulation of sediments in the valley.



Legend

- Project Area
- Potential Well Pad Location
- Gravel Pit Location
- Quaternary Faults

General Access

- Existing - No Improvement
- Existing - Needs Improvement
- New - Proposed

Geology from Coats, 1987, Geology of Elko County
Faults from dePolo, 2008, Quaternary Faults in Nevada

MAP 3.2-2

Geology

Huntington Valley
Oil and Gas Exploration Project

Elko County, NV — May 2014

Table 3.2-13 lists some drilling intersection data from four exploratory boreholes drilled in the south of the Project Area, as reported by Nevada Bureau of Mines and Geology (1988). Earlier exploratory drilling showed oil and gas traces throughout the Tertiary section. The Indian Well Formation with some high porosity targets and low permeability tuff caps has the most potential for economic hydrocarbons, at depths between 5,000 and 10,000 feet from surface.

Table 3.2-13
Formation Depths in Earlier Exploration Borings

ID Company/ Well	Sec Qtr/Qtr	Year	Depth (feet)	Hay Ranch Fm Top/thickness[1]	Indian Well Fm Top/thickness	Elko Fm Top/thickness
Wexpro Jiggs 10-1	10 SE/SE	1980	10,950	2,102 2,939	5,041 4,012	9,053 485
Cities Services Federal BL1	13 SE/SW	1982	10,045	4,676 ?[2]	?[2] ?[2]	8,695 380
Wexpro Jiggs 2	23 NE/SW	1981	10,300	3,400 2,620	6,020 ?[2]	~ 7,800 ?[2]
Wexpro Cord 24-1	24 NE/NE	1979	11,926	1,800 3,402	5,202 3,868	9,070 ?[2]

[1] Depth to top of Hay Ranch Formation is thickness of Quaternary alluvium.
[2] "?" means depth not picked in log.

As is true for the entire Basin and Range Province (which is most of the state of Nevada), in which valleys are downthrown on marginal faults up to tens of thousands of feet with respect to intervening ranges, seismic activity is continual (and has been for ten million years and more). Extensional tectonics throughout the Great Basin has thinned the crust and heat flow is higher than the continental average. This means that kerogen-bearing rocks are "matured" (in terms of generation of hydrocarbon fluids) at shallower depth than in most basins, but also potential hydrocarbon reservoirs are more likely to be fragmented by faulting.

Seismology. Six strong earthquakes (magnitude greater than 5) have occurred within the State of Nevada in a 56-year period, including a magnitude 6 quake near Wells in 2008 which damaged some older buildings. Magnitude 6 is felt by everyone, in or outside; windows break, books fall, and dishes and glassware are broken; damage is slight to moderate to poorly designed buildings. Magnitude 6 events should not damage modern buildings, and magnitude 7 events cause some damage to even well-built buildings or possibly steel construction.

Figure 3.2-2 shows a plot of earthquake data from Advanced National Seismic System records over the period 1950 to 2014, within a rectangle between Latitude 39 and 42 North, and Longitude 114 and 117 West (Elko County, extending south through Eureka County and west to Battle Mountain). This data set contains information from the Earthscope Transportable Array, a high sensitivity array on 80 km centers was deployed in northeastern Nevada for 1.5 years which detected lower magnitude earthquakes than are normally possible to detect using Nevada's typical seismograph array. The low magnitude end of the frequency is cramped by the brevity of the record with high sensitivity since all of the events smaller than magnitude 3 were recorded during the 1.5 year term that the sensitive array was deployed. The rest of the record is approximately linear on the log scale, with the single magnitude 6 event at Wells in February, 2008 showing as anomalous with respect to the rest of the record (drawing the straight line would suggest this magnitude has a return period of several hundred years in Elko County).

Figure 3.2-3 shows locations and magnitudes of earthquakes in the state over a 56-year period, not including the 2008 magnitude 6 event near Wells (Nevada Seismological Lab, 2005). This indicates that earthquakes with magnitude 5 or greater occur about once every decade in Elko County. Earthquakes are much more frequent and stronger in the western side of the state, along the Sierra Nevada, Walker Lane, and the central Nevada Seismic Zone. Figure 3.2-2 also shows a number of quakes less than magnitude 3 in Elko County; magnitude 2 quakes and smaller ("micro" quakes not felt by people) are not likely to be detected by the existing seismic network.

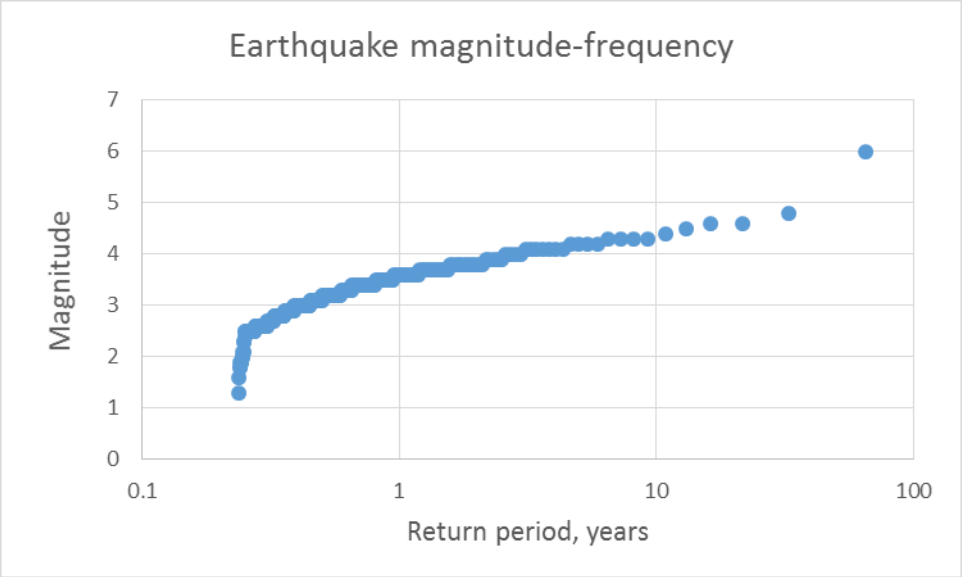


Figure 3.2-2
Earthquake Frequency in Elko County, 1950 to 2014
(Advanced National Seismic System, 2014)

Damage to oil field facilities by earthquakes has not been extensively documented, but the U.S. Geological Survey (USGS) published Professional Paper 1487 on damage by a fault near Coalingua, California, in 1987, when this was one of the larger production fields in the U.S. A magnitude 6.7 quake occurred on May 2, 1983; this is considerably stronger than the 6.0 2008 earthquake near Wells. The Coalinga quake triggered slides, severely damaged pre-1945 buildings, and toppled chimneys. There was minor damage to electric and water utilities, but power was interrupted for several days and oil production (which relied on electric pumps) was disrupted. Anchored oil field equipment and pipelines suffered minor damage, and leakage from those tanks that were affected was all contained. Some 26 of 935 active wells were found to have offsets cause by seismic activity. Damage to the oil field facilities was primarily to un-anchored tanks, no pipes were ruptured, and no environmental releases occurred.

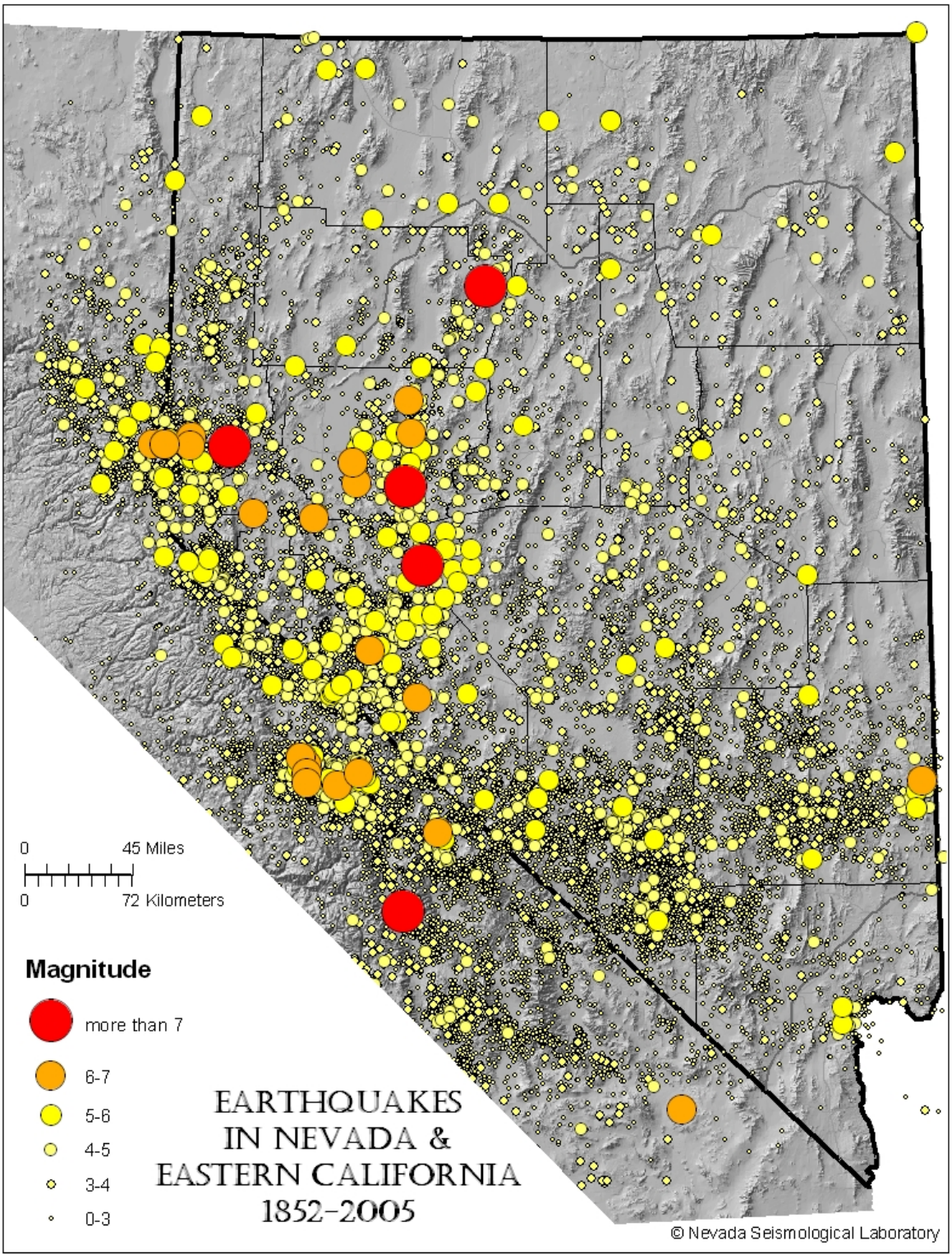


Figure 3.2-3
Earthquakes in Nevada and Eastern California 1852-2005
(Nevada Seismological Lab, 2005)

3.2.2.1.2 Minerals

Gold mines are close to the Project Area, one 15 miles northwest and a string of pits 25 miles southeast of the Project Area. The former is at the southern end of the “Carlin trend”, a major gold producing belt west of Elko, and the latter is on Alligator Ridge, south of the Ruby Mountains. Metals (gold and metal sulfide) mines occur in Paleozoic limestones in the uplifted ridges, whereas the hydrocarbon targets of the Proposed Action are in the Tertiary (and possibly deeper) strata in the downfaulted valley. The two regimes, metals in uplifts and hydrocarbons in valleys, are distinct and separated by boundary faults.

The several oil exploratory borings drilled from 1979 to 1982 in the valley penetrated to more than 10,000 feet depth, some of them several thousand feet below the Tertiary Elko Formation and into the Paleozoic. Oil was noted in the Wexpro Jiggs 10-1 well in T29N/R55E Section 10 SE/SE at over 10,000 feet depth in Mississippian rocks. This is in the central west portion of the Project Area. Hydrocarbons in the uplifted blocks are “graphitized” by metamorphism according to Cline et al. (2005), on which this description of the Carlin-type mineral resource is largely based.

Subsequent to the mineralization, valley margin faults developed vertical throws of up to 10,000 feet, the valleys filling with sediments eroded from the rising blocks and with volcanic ash and some lava flows from volcanic centers in various locations. Much of the fill in Huntington Valley is the Indian Well Formation, and the strata would include most likely reservoirs for oil or gas accumulations evolved from burial of the organic-rich (“oil shale”) Elko Formation.

A number of small private gravel pits are located within and near the Project Area.

3.2.2.2 Environmental Effects

3.2.2.2.1 Proposed Action Alternative

Implementation of the Proposed Action could result in production of approximately 4.6 million barrels (193.2 million gallons) of oil over a 20 year period. If an economic resource is proven, it is unlikely that this exploratory project would substantially reduce the resource. Existing mines near the Project Area would not be affected by the Proposed Action. Gravel for upgrading existing roads and constructing well pads would be obtained from two gravel operations within the Project Area.

Many questions have been raised about whether hydraulic fracturing — commonly known as “fracking”— is responsible for the recent increase of earthquakes. USGS’s studies suggest that the actual hydraulic fracturing process is only very rarely the direct cause of felt earthquakes. While hydraulic fracturing works by making thousands of extremely small “microearthquakes,” they are, with just a few exceptions, too small to be felt; none have been large enough to cause structural damage. However, underground disposal of wastewater co-produced with oil and gas, enabled by hydraulic fracturing operations, has been linked to induced earthquakes (Ellsworth et al., 2014).

Microearthquakes (that is, those with magnitudes below 2) are routinely produced as part of the hydraulic fracturing (or “fracking”) process used to stimulate the production of oil, but the process as currently practiced appears to pose a low risk of inducing destructive earthquakes. More than 100,000 wells have been subjected to fracking in recent years, and the largest induced earthquake was magnitude 3.6, which is too small to pose a serious risk. Yet, wastewater disposal by injection into deep wells poses a higher risk, because this practice can induce larger earthquakes. For example, several of the largest earthquakes in the U.S. midcontinent in 2011 and 2012 may have been triggered by nearby disposal wells. The largest of these was a magnitude 5.6 event in central Oklahoma that destroyed 14 homes and injured

two people. The mechanism responsible for inducing these events appears to be the well-understood process of weakening a preexisting fault by elevating the fluid pressure. However, only a small fraction of the more than 30,000 wastewater disposal wells appears to be problematic - typically those that dispose of very large volumes of water and/or communicate pressure perturbations directly into basement faults (Ellsworth, 2013).

While Noble is proposing to hydraulically fracture formations in the Huntington Valley Project Area, any resulting microearthquakes should be so small that they should not be felt by people nor cause damage to buildings. Fluid injection poses a greater risk of producing earthquakes of a magnitude that can be felt by people. The state of Nevada permits fluid injection wells and currently Noble does not hold any permit for fluid injection at the Huntington Project. If Noble were to obtain permits for fluid injection in the future then there would be a slight chance that earthquakes could occur.

The University of Nevada Seismological Laboratory currently monitors a total of 115 seismograph stations across the state of Nevada (the number varies slightly through time). The majority of the seismographs are located along the western side of Nevada. Five seismographs are currently located in northeastern Nevada. Three Netquake stations, located at Winnemucca (WNMCA), Elko (SPCK), and Wells (RUBY), are designed to detect major earthquakes with strong shaking and are located in the urban areas. Two Broadband stations, ELK located on the northeast end of the East Humboldt Range and LB_BMN, located south of Battle Mountain, are capable of detecting earthquakes in the range of magnitude 1 to 2.5 (micro-seismic events) if microearthquakes were to occur in the vicinity of the Huntington Valley Project. The two Broadband stations would alert scientists that micro-seismic events were occurring but the scientists would be unable to triangulate the location. Regional Station Map located at: http://www.seismo.unr.edu/Monitoring.

Mitigation Measures

The BLM would require the following mitigation measures to further reduce effects to geology and minerals in the Project Area:

- If Noble were to obtain an Underground Injection Control Permit and if broadband stations ELK and LB_BMN were to detect microearthquakes that seismologists had reason to believe could have been caused by Noble's activities, then BLM would work with Nevada Division of Minerals and the University of Nevada Reno Seismological Lab to determine if installation of a seismograph in the vicinity of the Huntington project would be warranted.
- Where possible microseismic events shall be recorded and data provided to the BLM; method for data collection would be either by a seismic listening tool downhole or a microseismic array on the surface near the well or other appropriate technology.

3.2.2.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts associated with the Well Pad K2J Access Alternative would be similar to those described above for the Proposed Action Alternative. The additional 0.28 acre of surface disturbance would not result in any additional impact to geology and minerals in the Project Area.

3.2.2.2.3 No Action Alternative

Under the No Action Alternative, no impacts to geology and minerals would occur from the either the Proposed Action Alternative or the Well Pad K2J Access Alternative. Existing mining in and near the Project Area would continue.

3.2.2.3 Cumulative Effects

The CESA for geology and minerals is the Project Area boundary plus a 3-mile buffer (see Table 3.1-2 and Map 3.1-2). The CESA includes the proposed Cedar Ridge Exploration Well, located approximately 3 miles to the west. Gravel use to maintain county roads would continue from four gravel pits in the area. No other mineral extraction ventures are active within or near the Project Area; consequently cumulative impacts to geology and mineral resources in the CESA from either of the action alternatives when added to the Cedar Ridge Well and gravel use would be minimal.

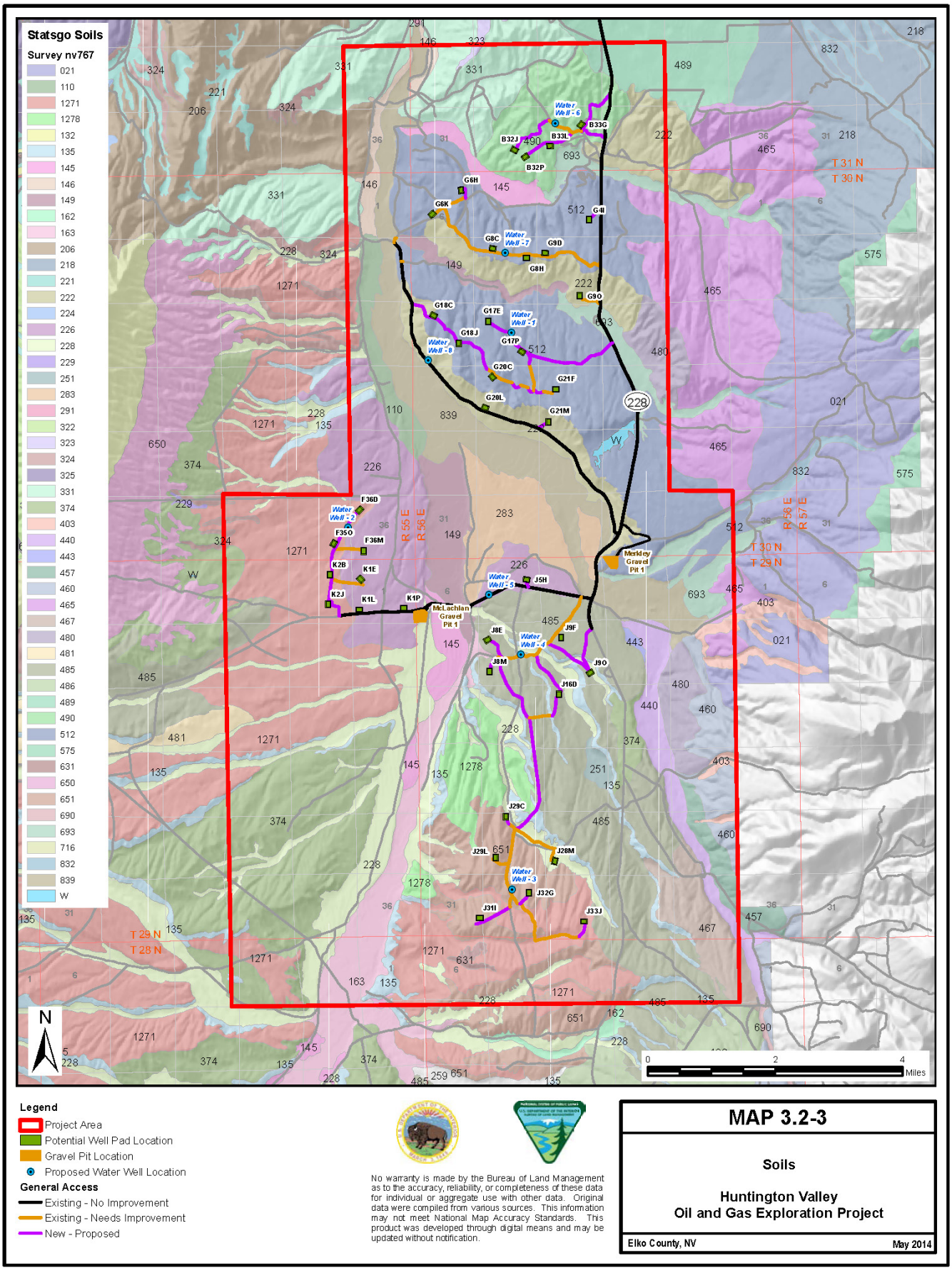
3.2.3 SOILS

3.2.3.1 Affected Environment

The Soil Survey of Elko County, Nevada, Central Part (Nevada 767) was used to identify and describe the soil types and characteristics within the Project Area. Tabular and spatial data for this soil survey area was downloaded from the Web Soil Survey (Natural Resource Conservation Service – NRCS, 2013a). Soil properties and limiting features are summarized by map unit in Table 3.2-14 and are shown on Map 3.2-3.

Thirteen soil mapping units would potentially be disturbed in the Project Area by the Proposed Action. All of the soil mapping units in the Project Area are soil “associations.” An association is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. During mapping, it was not considered practical or necessary to map the soils separately and the pattern and relative proportion of the soils are somewhat similar. The dominant soil series that make up the mapping unit generally have similar characteristics and properties. Other minor soil components or inclusions that may have similar or contrasting characteristics also typically occur within the mapping units. Because of the map scale used during the soil survey these minor soil components were not mapped separately. The objective of soil mapping is to separate the landscape into landforms or landform segments that have similar use and management requirements.

The various soil mapping units in the Project Area can generally be grouped into two soil groups based on their landscape position. These soil groups developed from alluvium (from mixed rocks) on floodplains, skirts, insets or on alluvial fan remnants and fan piedmonts. Generally, the water erosion hazard of these soils is slight to moderate and the wind erosion hazard is slight. The water erosion hazard of the soils typically increases with slope. Details for each of the soil groups are provided below.



Legend

- Project Area
- Potential Well Pad Location
- Gravel Pit Location
- Proposed Water Well Location

General Access

- Existing - No Improvement
- Existing - Needs Improvement
- New - Proposed

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

MAP 3.2-3

Soils

Huntington Valley
Oil and Gas Exploration Project

Elko County, NV — May 2014

Table 3.2-14
Project Area Soil Types and Limiting Characteristics in Proposed Disturbance Area

Map Unit Name and Map Symbol	Slope (%)	USDA Texture (surface horizon)[1]	Sensitive Soil Characteristics								
			Soil Compaction Rutting Hazard[2]	Hydric Soil[3]	Water Erosion Potential[4]	Water Table[5]	Flooding[5]	Saline/ Sodic[6]	Prime Farmlands[7]	Local Roads and Streets Limitations[8]	Reclamation Sensitivity
Soils found on Fans, Fan Piedmonts, Fan Remnants, Fan Skirts[9]. Ecological Site: Loamy and Chalky Knoll[10]											
Zevadez-Enko-Puett association 135	15 – 30	Gravelly loam/ Gravelly sandy loam/ Gravelly sandy loam	N/A	N/A	Moderate Severe (slope)	N/A	N/A	N/A	N/A	N/A	No
Enko-Zevadez-Puett association 222	2 – 50	Fine sandy loam/ Gravelly loam/ Gravelly sandy loam	N/A	N/A	Slight Severe (slope)	N/A	N/A	N/A	N/A	N/A	No
Enko-Rad association 226	2 – 8	Loam/ Silt loam	N/A	N/A	Slight	N/A	N/A	N/A	Farmland of Statewide Importance	N/A	No
Enko-Kelk association 228	0 – 8	Sandy loam/ Silt loam	N/A	N/A	Slight	N/A	Kelk Feb-June Long/ Occasional	N/A	Farmland of Statewide Importance	N/A	No
Hunnton-Wieland-Wieland, mod. steep association 485	2 – 30	Loam/ Loam/ Very gravelly loam	N/A	N/A	Slight Moderate (slope)	N/A	N/A	N/A	Farmland of Statewide Importance	N/A	No
Orovada-Bioya-Haybourne association 490	2 – 30	Fine sandy loam/ Very fine sandy loam/ Sandy loam	N/A	N/A	Slight/ Mod.	N/A	N/A	N/A	N/A	N/A	
Dacker-Zevadez-Kelk association 512	0 – 15	Silt loam/ Loam/ Silt loam	N/A	N/A	Slight/ Mod. (slope)	N/A	N/A	N/A	Farmland of Statewide Importance	N/A	No
Karpp-Chiara-Wieland association 651	2 – 15	Gravelly silt loam/ Silt loam	Yes Restrictive Layer	N/A	Slight/Mod. (slope)	N/A	N/A	N/A	N/A	N/A	Yes
Wieland-Enko association 1271	2 - 8	Silt loam/ Silt loam	N/A	N/A	Slight	N/A	N/A	N/A	N/A	N/A	No

Map Unit Name and Map Symbol	Slope (%)	USDA Texture (surface horizon)[1]	Sensitive Soil Characteristics								
			Soil Compaction Rutting Hazard[2]	Hydric Soil[3]	Water Erosion Potential[4]	Water Table[5]	Flooding[5]	Saline/ Sodic[6]	Prime Farmlands[7]	Local Roads and Streets Limitations[8]	Reclamation Sensitivity
Wieland-Kelk-Wieland, mod. steep association 1278	2 - 30	Gravelly loam/ Silt loam	N/A	N/A	Slight/ Mod. (slope)	N/A	N/A	N/A	N/A	N/A	No
Soils found on Floodplains[9]. Ecological Site: Loamy Bottom, Saline Meadow, Moist Floodplain, Dry Floodplain[10]											
Sonoma, freq. flooded-Devilsgait-Sonoma association 163	0 - 2	Silty clay loam/ Silt loam/ Silt loam	Yes Flooding Low Strength	Yes	Slight	0 – 3.5 ft all series	Dec-June Long-Frequent / Occasional	Yes	N/A	N/A	Yes
Welch-Woofus association 693	0 - 2	Loam/ Loam/ Loam	Yes Flooding Low strength	Yes	Slight	Mar-June 0.7-6 ft all series	Woofus Brief/ Frequent	N/A	N/A	N/A	No
Woofus-Tweba-Devilsgait association 839	0 - 2	Loam/Very fine sandy loam/Silt loam	Yes Flooding Low strength	Yes	Slight	Feb-July 0-6 ft all series	Brief-Long/Frequentall series	N/A	N/A	N/A	No

[1] USDA surface texture was obtained from *the Engineering Properties* table in the soil survey database.

[2] Construction of haul Roads and Soil Compaction/Rutting – sensitive soils include those with an NRCS rating of high or severe for the *Haul Roads, Log Landings, and Soil Rutting* category. Ratings are based on depth to a water table, rock fragments on or below the surface, the Unified classification, depth to a restrictive layer, and slope.

[2] Hydric Soils – at least one major named map unit soil is included on the county hydric soil list. A hydric soil is a soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part.

[2] Water Erosion Potential obtained from selected soil interpretations – Potential for Erosion Hazard off-road/off Trail.

[3] Flooding and water table potential obtained from the *Water Features* table. Rating is for the dominant soil in the map unit.

[6] Saline/sodic – rating obtained from *Chemical Properties* table; when the conductivity is greater than 8 mmhos/cm or the SAR is greater than 12, or both. Rating is for the dominant soil in the map unit.

[7] Prime farmland rating taking from the *Prime farmland* list in the soil survey. Rating is for any of the major soils in the map unit.

[8] Local Roads and Streets and the Shallow Excavations ratings were obtained from the *Roads and Streets, Shallow Excavations, and Lawns and Landscaping* table in the soil survey. Rating is for the dominant soil in the map unit.

[9] Landscape position was obtained from the *Map Unit Description* and describes the typical setting for the dominate soil in the map unit.

[10] An "ecological site" is the product of all the environmental factors responsible for its development. It has characteristic soils that have developed over time throughout the soil development process; a characteristic hydrology, particularly infiltration and runoff that has developed over time; and a characteristic plant community (kind and amount of vegetation). Ecological site was obtained from the map unit description.

Soils on Fans, Remnants and Fan Piedmonts

These soils are alluvial soils developed on fan remnants, skirts, insets and fan piedmonts. They typically have slopes of 2 to 30 percent, are well-drained, and are very deep (greater than 60 inches) to moderately deep (20 to 40 inches) over a restrictive layer (duripan). The available water capacity is high to low depending on the depth to the duripan. These soils do not have a seasonal water table and are not flooded. The ecological site of these soils is predominantly Loamy in the 8 to 10 inch precipitation zone. Generally, the water erosion hazard of these soils is slight to moderate and the wind erosion hazard is slight. The water erosion hazard of the soils in this group typically increases with slope. One map unit (490) is saline and or sodic at the surface.

The characteristic vegetation of these soils on these landscapes include Wyoming big sagebrush, Bluebunch wheatgrass, Thurber's needlegrass and Sandberg bluegrass, with other shrubs, perennial grasses and forbs typically occurring less frequency.

None of the soils in this category are classified as Prime Farmlands. Four soil map units are listed as "Farmland of statewide importance." These include Enko-Rad association (map unit symbol 226) and Enko-Kelk association (map unit symbol 228), Hunnton-Wieland-Wieland, mod steep association (map unit symbol 485) and Dacker-Zevadez-Kelk association (map unit symbol 512).

Soils on Floodplains

These alluvial soils are on floodplains crossed by proposed new roads and existing roads needing improvement within the Project Area. These soils typically have slopes between 0 and 2 percent, are very deep (greater than 60 inches), poorly drained, and have high available water content. These alluvial soils have a seasonal high water table and may be flooded in the late winter to early summer. All three map units are designated as hydric, and the Sonoma soil is saline and or sodic at the surface. The wind and water erosion hazard of the soils in this group is slight. The Ecological Site of these soils includes: Moist Floodplain Dry Floodplain, Loamy Bottom, and Saline Meadow. None of the floodplain soils potentially affected by the Proposed Action are classified as Prime Farmlands or Farmlands of Statewide Importance.

The characteristic vegetation of the soil mapping units that formed on the floodplains is more varied than the soils on fans and fan piedmonts and differ by Ecological Site. The typical vegetation on the Moist Floodplain Ecological Site is generally characterized by wildrye, Nevada bluegrass, inland saltgrass, Sierra clover, and willows. The Dry Floodplain Ecological Site is generally characterized by Basin wildrye, alkali sacaton, basin big sagebrush, and black greasewood. The Loamy Bottom Ecological Site is generally characterized by basin wildrye, Nevada bluegrasses, and basin big sagebrush. The Saline Meadow Ecological Site is generally characterized by alkali muhly, alkali sacaton, inland saltgrass, alkali bluegrass, and alkali cordgrass.

3.2.3.2 Environmental Effects

3.2.3.2.1 Proposed Action Alternative

Under the Proposed Action, direct impacts to soils would occur during construction (i.e., clearing, grading etc.) associated with building new roads, upgrading of existing roads, and construction of well pads and gravel pits (see Map 3.2-3). A list of soils identified for potential disturbance for 39 well pads, gravel pits, and associated access roads (428.1 acres) is provided in Table 3.2-15 by mapping unit; however, no more than 20 of the 39 identified well pads and associated access roads would be constructed resulting in an estimated disturbance of 314.1 acres (0.7 percent of the Project Area) in the short-term. Of this, approximately 92.5 acres associated with temporary road disturbance and drilling pad disturbance would be reclaimed after construction and 221.6 acres would remain in the long-term.

Table 3.2-15
Soils Potentially Impacted

Map Unit Name (Map Symbol[1])	**Project Area (acres) [2]**
Soils found on Fans, Fan Piedmonts, Fan Remnants, Fan Skirts, Hills[3] Ecological Site: Loamy and Chalky Knoll[4]	
Zevadez-Enko-Puett association (135)	2.5
Enko-Zevadez-Puett association (222)	25.3
Enko-Rad association (226)	50.0
Enko-Kelk association (228)	27.5
Hunnton-Wieland-Wieland, mod. Steep association (485)	60.0
Orovada-Bioya-Haybourne association (490)	40.2
Dacker-Zevadez-Kelk association (512)	142.2
Karpp-Chiara-Wieland association (651)	32.0
Wieland-Enko association (1271)	47.5
Wieland-Kelk-Wieland, mod. Steep association (1278)	0.3
Soils found on Floodplains.[3] Ecological Site: Loamy Bottom, Saline Meadow, Moist Floodplain, Dry Floodplains[4]	
Sonoma, freq. flooded--Devilsgait-Sonoma association (163)	0.1
Welch-Woofus association (693)	0.1
Woofus-Tweba-Devilsgait association (839)	0.4
Total	**428.1**

[1] Alphabetic letter designations on soil mapping units which are the same between soil survey areas are corresponding to abutting mapping units across the survey boundary lines.

[2] Disturbance acres were determined by GIS analysis. Road disturbance acres are based on a construction disturbance width of 31 feet for resource roads and 29 feet for local roads and include any existing roadway.

[3] Landscape position was obtained from the *Map Unit Description* and describes the typical setting for the dominant soil in the map unit.

[4] An "ecological site" is the product of all the environmental factors responsible for its development. It has characteristic soils that have developed over time throughout the soil development process; a characteristic hydrology, particularly infiltration and runoff that has developed over time; and a characteristic plant community (kind and amount of vegetation). Ecological site was obtained from the map unit description.

Potential soil effects include increased soil erosion from the loss/removal of vegetation which exposes soils and from soil compaction. Soil compaction from heavy construction equipment traffic has the potential to damage soil structure, which decreases soil porosity and soil infiltration rates and increases runoff and the potential for erosion and off-site sedimentation. Other potential effects include the loss or mixing of topsoil through grading. Soil productivity can also be decreased when invasive non-native species and noxious weeds invade disturbed areas. This invasion on disturbed areas can occur on all soil types but the potential for invasion is typically greater on soils that are difficult to reclaim because of their sensitive or droughty characteristics. Soil productivity can also be affected by contamination from spills of fuels and lubricants or drilling fluids.

All soils potentially affected by the Proposed Action have a slight to moderate erosion potential, although vegetation removal and clearing and grading have the potential to increase soil erosion potentials. Soils potentially affected by the Proposed Action typically do not have a soil compaction or rutting hazard, and therefore, repeated travel of heavy equipment during grading could cause soil compaction and increased erosion. However, the potential for soil erosion and sedimentation would be minimized by implementation of a Stormwater Pollution Prevention Plan. This plan would identify possible pollutant sources to stormwater and outline the BMPs that would be used to reduce or eliminate possible soil and water quality impacts. Dust suppression would be implemented if necessary.

The soils potentially affected by the Proposed Action have few limiting characteristics that would affect their reclamation potential, as long as appropriate seed mixtures and reclamation procedures are implemented (see measures included in the Huntington Valley Reclamation Plan – Appendix G). The measures consider the soils, vegetation, and ecological site conditions, as well as the semi-arid climate, which is a limiting factor for reclamation success, particularly in drought years. The measures describe the soil management/topsoil salvaging procedures that would be implemented to save and protect topsoil resources on disturbed areas. BMPs are outlined that would be utilized, as appropriate, to minimize erosion during construction and reclamation. Site preparation and seeding procedures would be implemented to ensure revegetation success including: compaction mitigation, redistribution of topsoil, seeding methods, appropriate seed mix development, seeding rates, seedbed preparation and appropriate seeding dates for the Project Area and reclamation monitoring requirements.

Measures would be implemented to minimize and reduce the potential for the spread of invasive non-native species and noxious weeds during construction, such as cleaning vehicles and equipment, early detection and treatment, using application methods, prior to ground-disturbing activities and the use of weed free materials (gravel, mulch, etc.) (see Huntington Valley Integrated Weed Management Plan – Appendix F). Monitoring of noxious weeds would occur on all development sites throughout the life of the Project.

Hydric soils occur on a small percentage of land (0.6 acres) classified as floodplains in the proposed disturbance area that are associated with proposed or existing road improvements. However, based on review of aerial photography, the areas of proposed new road construction on Soil Mapping Units 163 and 693 (0.2 acres) appear to be in upland rangeland areas that would not have hydric soil characteristics. Existing road improvement (0.4 acres) on Soil Mapping Unit 839 may experience surface flooding periodically throughout the year due to snowmelt or thunderstorms. Seasonal water tables (within 5 feet of the surface) may be present for 6 months (February through July) during the year in the hydric soil areas.

Road construction or upgrading of existing roads would impact soils during construction. The roads would be crowned, ditched, and graveled and would meet the Gold Book Standards (BLM and Forest Service, 2007) and the BLM Road Manual 9113 (BLM, 2011a). Topsoil would be removed from all construction areas to a depth of 6 inches or as directed by the BLM. Topsoil would be placed in stockpiles that minimize wind or water erosion and seeded with a temporary seed mix to minimize topsoil loss. Topsoil would be replaced to a depth of six (6) inches after the area has been ripped to depth of 1 foot. Noble would implement appropriate sediment controls BMPs, as necessary to ensure the potential for erosion and sedimentation are reduce or eliminated during road construction/improvement activities.

No prime or unique farmlands occur in the district; therefore, no effects to prime farmland soils would occur. Four mapping units that would be affected by the Proposed Action are classified as soils of statewide importance. None of these soils are currently irrigated or farmed.

Mitigation Measures

The BLM has not identified mitigation measures in addition to the Project Design Features (see Section 2.2.1.6) which include implementation of the BLM-approved Huntington Valley Reclamation Plan to further reduce effects to soils.

3.2.3.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts associated with the Well Pad K2J Access Alternative would be similar to those described above for the Proposed Action Alternative. The additional 0.28 acre of surface disturbance would result in minimal additional impact to soils.

3.2.3.2.3 No Action Alternative

Under the No Action Alternative, there would be no impacts from the Proposed Action Alternative or the Well Pad K2J Access Alternative to soils in the Project Area.

3.2.3.3 Cumulative Effects

The CESA for soils encompasses 833,399 acres (see Table 3.1-2 and Map 3.1-5). Between 1999 and 2013, 158,724 acres (or 19 percent) within the CESA have been impacted by fire, and various vegetation treatments have been applied to 92,201 acres (or 11 percent) (see Table 3.2-16). The surface disturbance associated with the past and present actions and RFFAs (e.g., rights-of-way, pipelines, oil and gas activities, mines) is estimated to be 14,537 acres, and when combined with the 314 acres of surface disturbance proposed for the Project, the total is 14,851 acres or 2 percent of the CESA (see Table 3.2-16). The unincorporated community of Jiggs and Spring Creek, which is a census-designated place, are also located within the CESA as well as portions of SR 227 and 228. Cumulative effects to soils (e.g., erosion, compaction) occur as a result of these various natural and man-made factors. Although soils are generally negatively affected by these impacts, they have not resulted in any major or high intensity impacts to soil quality on a large spatial or temporal scale within the CESA.

On-going effects would continue under the No Action Alternative. As described above, the Proposed Action Alternative and the Well Pad K2J Alternative could result in additional impacts to soil resources; however, with implementation of Project Design Features such as adherence to the Stormwater Pollution Prevention Plan and Spill Prevention Plan, cumulative effects to soils would not substantially increase.

Table 3.2-16
Acres Affected within Watershed Cumulative Effects Study Area

Resources	Acres within CESA	Acres Disturbed by Fire [1] (% of CESA)	Acres of Vegetation Treatments [2] (% of CESA)	Acres of Disturbance within Cumulative Effects Study Area by Past, Present, and RFFA's [3]				Acres of Total Project Effects	Total Cumulative Disturbance Acres (% of CESA)
				Case Type	Authorized & Pending	Closed	Total		
Native American Concerns; Hydrology; Invasive, Non-Native Species; Soils; Vegetation; Migratory Birds; Special Status Species; Wildlife, Fisheries	833,399	158,724 (19%)	92,201 (11%)	Rights-of-Way: Pipelines, Power lines, Fiber Optic Cable, Telephone Lines, Roads, Fences, Railroad	1,616	65	**1,681 (0.2%)**	314 [4] (0.04%)	14,851 [5] (2%)
				Oil & Gas; Mines; Mineral Material Sites: Sand, Gravel, topsoil sources and pits	12,122	734	**12,856 (1.5%)**		

[1] Source: BLM GIS Data. Historic Fires (1999-2013).
[2] Source: BLM GIS Data. Vegetation Treatments (1999-2013).
[3] Reasonably Foreseeable Future Actions (RFFAs). Source: BLM GIS Data. Land Lines/Land Points and Mineral Material Sites data (2013). Acres are approximate and are conservative, using the total area of the project boundaries to calculate the surface disturbance rather than the areas within the boundaries actually disturbed by the specific projects.
[4] Disturbance based on 20 well pads.
[5] Total is the sum of 1,681 and 12,856 and 314.

3.2.4 HYDROLOGY

3.2.4.1 Affected Environment – Surface Water

Perennial Huntington Creek drains and flows north out of the Project Area to the South Fork of the Humboldt River. Huntington Creek is fed by perennial tributaries originating in the Ruby Mountains, which rise to over 8,000 feet elevation. Streams in the Project Area typically have meandering channels incised in broader floodplains (see Map 3.2-4).

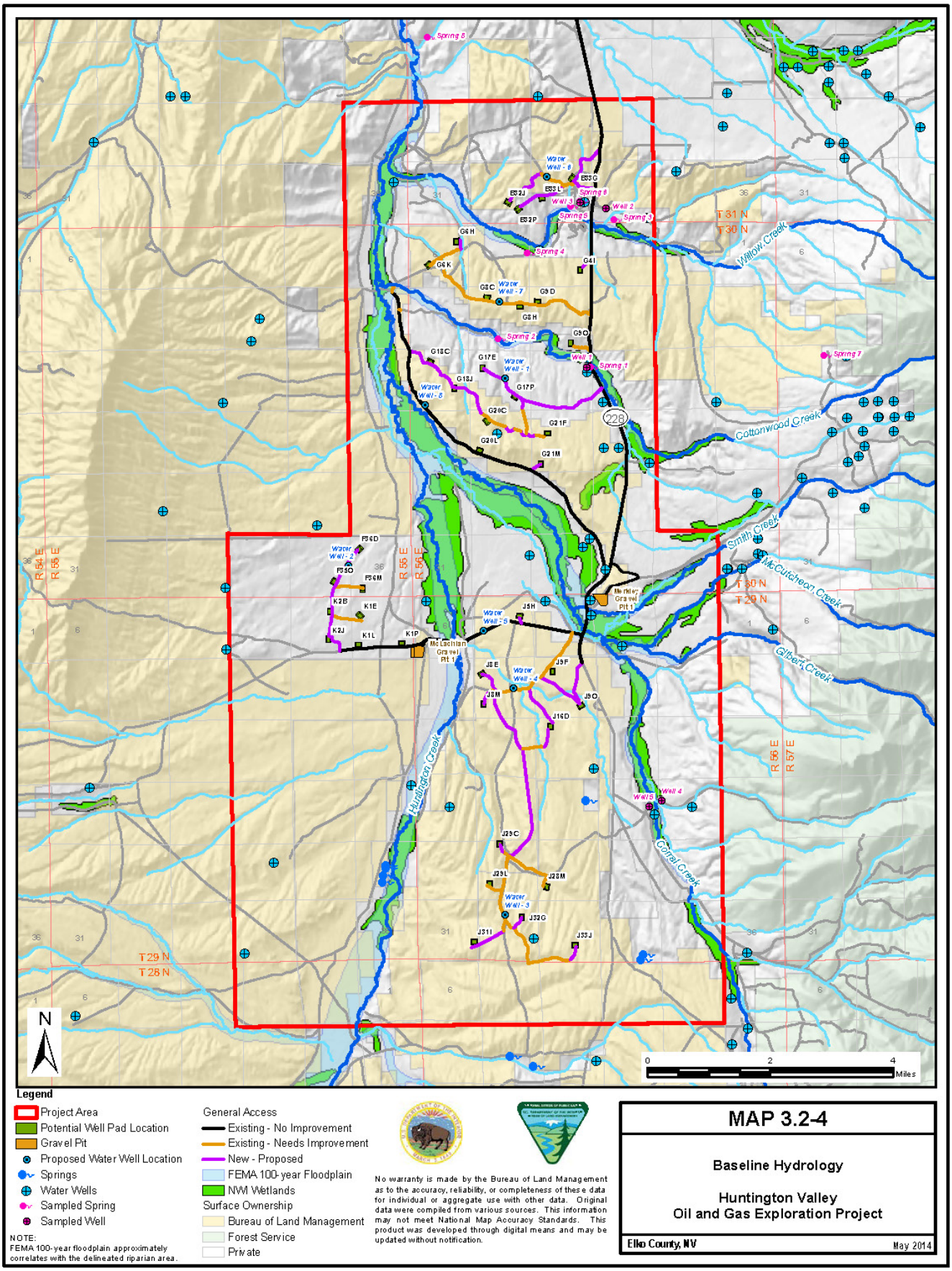
The hydrograph of Huntington Creek is dominated by spring runoff from those mountain streams, and declines to a baseflow consistently close to 20 cubic feet per second (cfs) in late summer. A hydrograph from USGS gauge 10319500 on this creek for the period 1948 to 1972 is shown on Figure 3.2-4. Bars on the figure show lowest and highest recorded flows, and the line-connected points show the monthly averages for the period of record.

Plume and Smith (2013) monitored streamflow in Huntington Creek at six locations and tributaries in four locations in the Project Area from 2008 to 2009. They note that the stream loses flow to groundwater over much of the upper basin (from Defue Spring to near Jiggs) most of the year, but is a gaining stream in the north of the Project Area down to the confluence with the South Fork Humboldt River. South Fork Reservoir is situated on the South Fork just above the confluence with the main stem Humboldt River, northwest of the Project Area.

There are a few springs in the catchment, notably Defue Spring in the headwater of Huntington Creek south of the Project Area, and a series of “improved springs” near a cattle feedlot in Section 25. The latter consist of trenches cut in the terrace above Huntington Creek, directing shallow groundwater in alluvial fans coming off Cedar Ridge to a meandering channel pond in the bottomland. Other springs in the Project Area are seeps from alluvium, probably sourced by shallow groundwater perched on silt layers. Elsewhere in the upper Humboldt Basin similar springs are supported by basal tuff in the Humboldt (Hay Ranch) Formation.

In April of 2014, Noble sampled springs in and outside of the Project Area as part of their baseline sampling program. Results are discussed below in Section 3.2.4.5, Groundwater.

The State of Nevada has completed some analyses of water quality which apply to the Project Area. The Clean Water Act of 1972 requires that all states conduct a comprehensive analysis of water quality data associated with surface waters every two years to determine whether state surface water quality standards are being met and designated uses are being supported. The NDEP-Bureau of Water Quality Planning (BWQP), with oversight from the EPA, implements the Clean Water Act in Nevada. According to the 2008-10 EPA-approved water quality assessment for Nevada and the Draft 2012 Integrated Water Quality Report, which has been submitted to the EPA for approval, the beneficial uses for the Humboldt River are aquatic life, industrial supply, irrigation, municipal, and domestic supply, propagation of wildlife, contact and non-contact recreation, and watering of livestock (NDEP, 2013c, d and e). As a tributary to the Humboldt River, the beneficial uses are the same for Huntington Creek and other tributaries in the Project Area.



Legend

- Project Area
- Potential Well Pad Location
- Gravel Pit
- Proposed Water Well Location
- Springs
- Water Wells
- Sampled Spring
- Sampled Well

General Access
- Existing - No Improvement
- Existing - Needs Improvement
- New - Proposed
- FEMA 100-year Floodplain
- NWI Wetlands

Surface Ownership
- Bureau of Land Management
- Forest Service
- Private

NOTE:
FEMA 100-year floodplain approximately correlates with the delineated riparian area.

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

MAP 3.2-4

Baseline Hydrology

Huntington Valley
Oil and Gas Exploration Project

Elko County, NV — May 2014

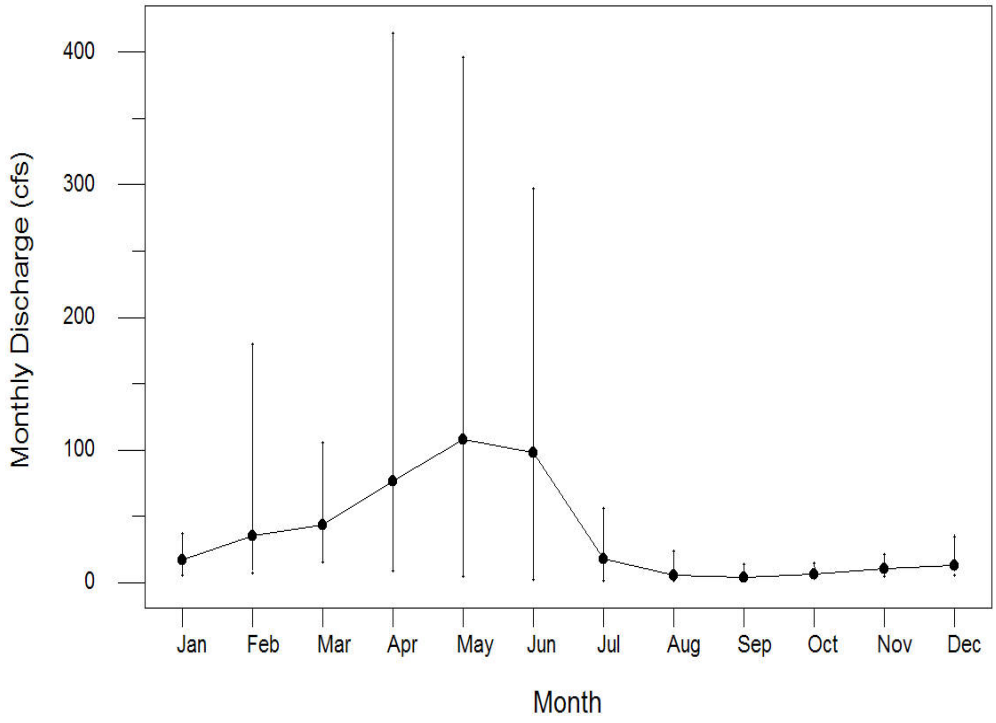


Figure 3.2-4
Hydrograph with Monthly Average Flows at USGS Gage 10319500 from 1948 to 1972

The Clean Water Act requires states to compile a list of waterbodies, known as the 303(d) list, that do not fully support their designated uses. According to the 2008-10 EPA approved 303(d) list and the 2012 Draft, Huntington Creek in the southern portion of the Project Area, from the White Pine county line to its confluence with Smith Creek is listed as a Category 3, which indicates there is insufficient available data to make a use support determination. From its confluence with Smith Creek to its confluence with the Humboldt River, Huntington Creek is listed as a Category 5 (non-attaining for aquatic life, recreation involving contact with water, and municipal or domestic supply for the parameters total phosphorus and total dissolved solids - TDS) (NDEP, 2013 c, d, and e). Category 5 streams do not support all uses and a Total Maximum Daily Load (TMDL) requirement, to achieve compliance, is needed. Huntington Creek is listed as a low priority and no timeline for developing a TMDL has been determined. No assessment data is available for the other perennial streams in the Project Area. Feedlots and irrigation potentially affect stream water quality in the Project Area, and seasonal low-flow periods cause temperature rises impacting aquatic life. Huntington Creek is listed as not meeting several water quality criteria including TDS and phosphorus, but there is no information available on sources of these constituents in the watershed.

Surface water rights in the Project Area are listed in Table 3.2-17. Stream water use consists of stock and wildlife consumption by direct access, and irrigation in T30N, R56E sections 2, 19, and 35; and in T29N, R56E sections 1, 3, 4, and 10.

Table 3.2-17
Surface Water Rights in the Project Area

Application Number	Source	Location				Type Of Use	Owner	Status
3135	Spring	29N	56E	26	SESE	Irrigation	Barnes Ranches Inc.	Certificate
17062	Spring	29N	55E	25	SWNE	Stock Watering	Mclachlan, Scott C.	Certificate
17063	Spring	29N	55E	25	NWSE	Stock Watering	Mclachlan, Scott C.	Certificate
45134	Spring	29N	56E	21	NENE	Stock Watering	Barnes Ranches Inc.	Certificate
1271	Stream	29N	56E	10	SE	Irrigation	Merkley Ranches	Certificate
1273	Stream	29N	56E	3	SESE	Irrigation	Merkley, Ernest L, Alice Hankins And E. Ray	Certificate
1272	Stream	29N	56E	4	NESE	Irrigation	Zunino Ranches, Inc.	Certificate
3091	Stream	30N	56E	35	SWSW	Irrigation	Hankins, Julia E.	Certificate
71019	Stream	30N	56E	35	NESE	As Decreed	Shurtz, Roy & Lisa	Certificate
2295	Stream	30N	56E	19	NWSW	Irrigation	Mclachlan, Scott C.	Certificate
60865	Spring	31N	56E	33	NWSE	Commercial	Reed Ranching Co., Inc.	Certificate

3.2.4.2 Environmental Effects – Surface Water

3.2.4.2.1 Proposed Action Alternative

Potential impacts of industrial activity to surface water may include erosion and sedimentation from disturbed areas, and disruption of channels and riparian erosion by crossings, contamination by spills and leaks, and depletion of flows by drawdown of groundwater by extraction. Implementation of Project Design Features as detailed in Chapter 2 would reduce erosion and sedimentation. These design features would prevent industrial surface water contamination except in extremely rare events, and would reduce the impacts to surface water if they were to occur.

As with any project which creates new surface disturbance and alters physical properties of the soil, there is likely to be some increased erosion and deposition of soil material in surface waters. The proposal includes activities that are designed to minimize these effects but they would likely still occur especially during exceptional runoff events. Erosion from well pads and other disturbed areas would be prevented through BMPs used for stormwater and sediment control.

No damming or diversions would be made in or outside channels or riparian areas, other than temporary stormwater control berms at drilling sites. No surface water would be withdrawn for any purpose, nor any discharge made to stream channels. Proposed disturbance is not planned within 400 feet of streams or waterbodies (except for 0.04 mile of access road on the east end of the Project Area).

Erosion and deposition are naturally occurring processes in the watershed and the Proposed Action would add a small amount to these effects.

The presence and use of industrial chemicals directly related to the project introduces the potential for spills and leaks to impact surface waters. Potential contaminants include diesel fluid, gasoline, lubricants, and other material involved in pad and well construction. The potential for leaks and spills to affect surface waters is greatly reduced by the Project Design Features described in Chapter 2. Spill prevention plans and chemical staging and containment are

designed to prevent contamination of soil and runoff water. Disposal wells would have their own containment including tanks and lined berms to prevent any leaks or spills escaping. Fueling would not occur within 400 feet of streams or waterbodies. Toxic materials would be fully contained and would not be subject to the effects of flood or rainfall events. With implementation of the above described measures, potential impact to surface water would be prevented except during very rare events or accidents. Section 3.2.4.5, Groundwater, below, provides additional detail regarding impacts to groundwater levels and quality from the Proposed Action.

Mitigation Measures

The BLM has identified the following mitigation measures in addition to the Project Design Features (Section 2.2.1.6) to further minimize potential impacts to surface water resources.

Based on the MOU with the DRI to collect and analyze monitoring wells (1 monitoring well per drill site) in the Project Area for 0, 2, and 12 months after the fracking process, BLM requires that the Project continue to sample these locations until the wells are plugged and abandoned, using the same criteria as outlined in the DRI MOU (the analyte list may be adjusted at the discretion of the BLM AO). Items to add include:

- After oil production starts, monitoring well samples shall be collected bi-annually (spring and fall).
- The eight springs sampled in the base level study shall continue to be sampled bi-annually (spring and fall).
- A sample site shall be established on Huntington Creek. The site will have stream discharge measured and stream samples collected bi-annually (spring and fall).
- All water samples (well, spring, and stream) shall be analyzed for parameters outlined in the DRI MOU.
- Results of the monitoring shall be submitted to the BLM bi-annually as well as any results submitted to the regulatory State agencies (i.e., NDOM and NDEP).
- Monitoring and reporting shall continue until one year after the last oil production well is plugged and abandoned.
- In the event that the above sampling sites have credible “hits” to analyze constituents, then the following shall occur:
    - The BLM shall be notified by letter within two weeks of the sampling event.
    - Sampling frequency shall increase to monthly to determine if the “hits” are present. BLM shall be notified of the monthly sampling results.
    - After six months, if the concentrations of constituents drop below the maximum threshold, then sampling shall return to the normal sampling schedule.
    - If the constituents concentration remain above the maximum threshold, then mitigation plans shall be implemented. BLM and Noble shall meet to discuss options, including technologies of pump-and-treat either onsite or offsite.

3.2.4.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts associated with the Well Pad K2J Access Alternative would be similar to those described above for the Proposed Action Alternative. The additional 0.28 acre of surface disturbance would result in minimal additional impact to surface water quality and water supply.

3.2.4.2.3 No Action Alternative

Under the No Action Alternative, no impacts to surface water would occur from either the Proposed Action Alternative or the Well Pad K2J Access Alternative.

3.2.4.3 Affected Environment – Wetland/Riparian/Floodplains

Most of wetlands in the Project Area occur on private lands. Wetlands mapped in the National Wetland Inventory (NWI) indicate that 96 percent are on private lands along Huntington Creek and its tributaries Willow Creek, Cottonwood Creek, Smith Creek, Gilbert Creek, and Corral Creek (Map 3.2-4). Ninety-one percent (4,785.4 acres) of the NWI wetlands on private lands are freshwater emergent wetlands while four percent (227.9 acres) are freshwater forested/shrub wetlands along Smith Creek. Three percent (143.3 acres) are associated with Zunino/Jiggs Reservoir on BLM-administered land. The reservoir is currently dry (NDOW, 2013a). Minor amounts (80.6 acres or two percent) of emergent and forested and forested/shrub wetlands are on BLM-administered lands.

During on-site vegetation surveys conducted in 2012, HWA (2012a) observed that most of the NWI wetlands within the Project Area were vegetated by agricultural hay pastures (4,126.6 acres or 79 percent of the NWI wetlands) and upland terrestrial vegetation types including sagebrush-grasslands (302.9 acres or 6 percent of the NWI wetlands), sagebrush/rabbitbrush mix (89.2 acres or 2 percent of the NWI wetlands), and other upland vegetation types (172.3 or three percent of the NWI wetlands). Only 546.2 acres of the NWI wetlands were mapped as riparian vegetation, including Zunino/Jiggs Reservoir (HWA, 2012a).

A 100-year floodplain is defined by the Federal Emergency Management Agency (FEMA) as the area adjacent to a watercourse that has a 1 percent chance of becoming wet in any single year (FEMA, 1992). A 100-year floodplain has not been delineated for this area. Map 3.2-4 shows the extent of the floodplains associated with the perennial streams in the area. Approximately 1 percent of the Project Area is mapped as riparian, most of which is located on private lands adjacent to Huntington Creek and Smith Creek.

3.2.4.4 Environmental Effects – Wetland/Riparian/Floodplains

3.2.4.4.1 Proposed Action Alternative

Construction in or adjacent to wetlands could potentially degrade water quality, affect hydrology and affect fish and wildlife. Construction of the Proposed Action could directly and/or indirectly affect wetland and riparian habitats present in the Project Area by accidental release of diesel fuel and lubricants which are toxic to aquatic organisms (see Section 3.3.5, Wildlife and Fisheries). No floodplains have been delineated for the Project Area.

In compliance with the Elko RMP, a 400-foot buffer was created for perennial wet areas in the Huntington Valley Project Area by identifying perennial steams reported by the National Hydrography Dataset (USGS, 2014). Intermittent streams were not included in the buffered area. Riparian and wetted areas were identified on the ground and using satellite imagery to define areas that would be avoided by a buffer zone of 400 feet. A 400-foot buffer was applied to the perennial wet area. Proposed disturbances would be at least 400 feet from all streams, creeks, and wetland areas except for 0.04 mile of access road on the eastern edge of the Project Area. Fueling of vehicles would not occur within 400 feet of any riparian areas or standing or flowing surface water (including streams, ponds, springs, seeps and stock reservoirs). Accidental spills in dry land habitats would pose only minimal risk to wetlands because Noble would implement a Spill Prevention Plan and Stormwater Prevention Plan which include measures to prevent spills from reaching surface water.

Mitigation Measures

The BLM has not identified mitigation measures in addition to the Project Design Features (see Section 2.2.1.6) to further reduce impacts to wetland/riparian/floodplains.

3.2.4.4.2 Well Pad K2J Access Alternative

Direct and indirect impacts associated with the Well Pad K2J Access Alternative would be similar to those described above for the Proposed Action Alternative. The additional 0.28 acre of surface disturbance would not result in any impact to wetland/riparian/floodplains.

3.2.4.4.3 No Action Alternative

Under the No Action Alternative, no impacts to wetlands, riparian areas, or floodplains would occur from either the Proposed Action Alternative or the Well Pad K2J Access Alternative.

3.2.4.5 Affected Environment – Groundwater

Two regional hydrogeology reports by the USGS (Heilweil and Brooks, 2010; and Plume and Smith, 2013) frame the groundwater characterization of this assessment. Heilweil and Brooks describe the bedrock carbonate and basin fill aquifers of the entire Basin and Range Province, and Plume and Smith survey groundwater in the Upper Humboldt River Basin which includes Huntington Valley.

Regional Aquifers

Figure 3.2-5 from Heilweil and Brooks (2010) shows a three-dimensional model of an area including Huntington Valley at the top center of the figure. This shows a trough of buff colored upper valley fill deposits overlying lavender lower valley fill, over a basement of (largely dark blue) carbonate (limestone) rocks which rise in the uplifted west side of the valley, and against the Ruby Mountain mass of igneous and metamorphic rocks. An east-west cross section from this figure is shown in Figure 3.2-6. This shows the Huntington Valley at the left side (under the "Humboldt flow system") with the (blue) carbonate basement rocks downthrown to near sea-level on the west side of the valley and over 10,000 feet below sea level against the Ruby Mountains, overlain by valley fill deposits which drape onto the western ranges. Heilweil and Brooks (2010) includes upper Cretaceous or lower Tertiary volcanic rocks in valley fill deposits, but they (volcanics) are not part of the lower valley fill aquifer, which is limited to the Indian Well Formation.

The upper valley fill consists of the Hay Ranch Formation and overlying Quaternary deposits. These include sand and gravel alluvium shed by the valley sides, clay and silt deposited in former lakes and playas, and some boulder gravels probably created by earthquake-released landslides. All water supply wells in the valley are completed in the upper valley fill deposits, with a few in the north of the Project Area possibly completed in the Hay Ranch Formation and the rest in the Quaternary alluvium. Plume and Smith (2013) report that supply wells in the valley for which some pumping test data were reported to the State Engineer show transmissivity in the range 650 to 1,000 square feet per day ft^2/day.

The lower valley fill deposits include the lower Tertiary Elko Formation oil shales and the Indian Well Formation, which includes sandstones, limestones and volcanic layers (flows and ash beds). The upper part of this formation is an aquifer of unknown hydraulic properties, except that shale and ash beds must be confining beds isolating more permeable strata. The lower part of the Indian Well Formation has slow-moving water and possibly hydrocarbon fluid reservoirs, and is the principal target of Noble's exploration program.

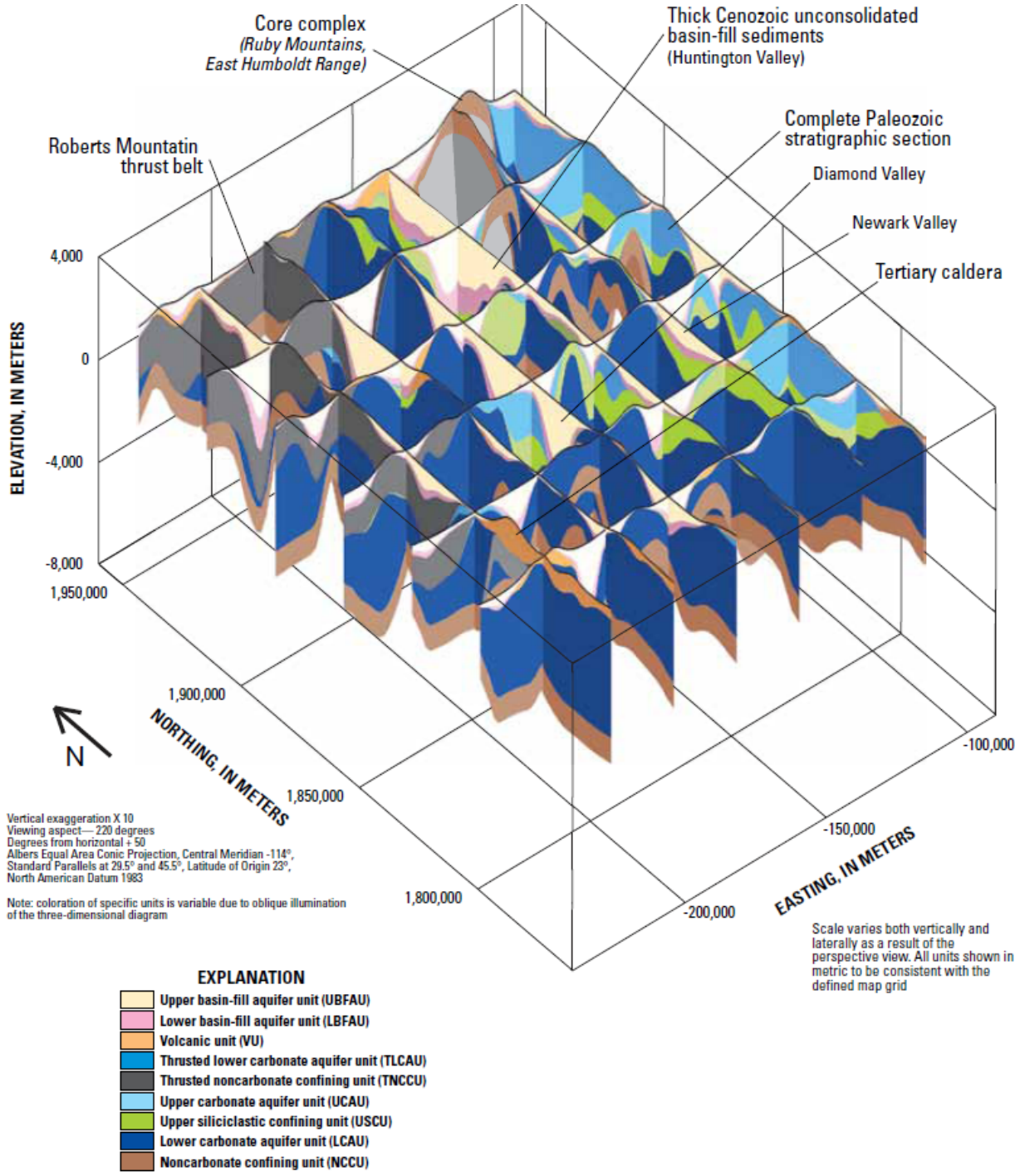


Figure 3.2-5
Three-Dimensional Hydrogeological Framework of Central Nevada
(Heilweil and Brooks, 2010)

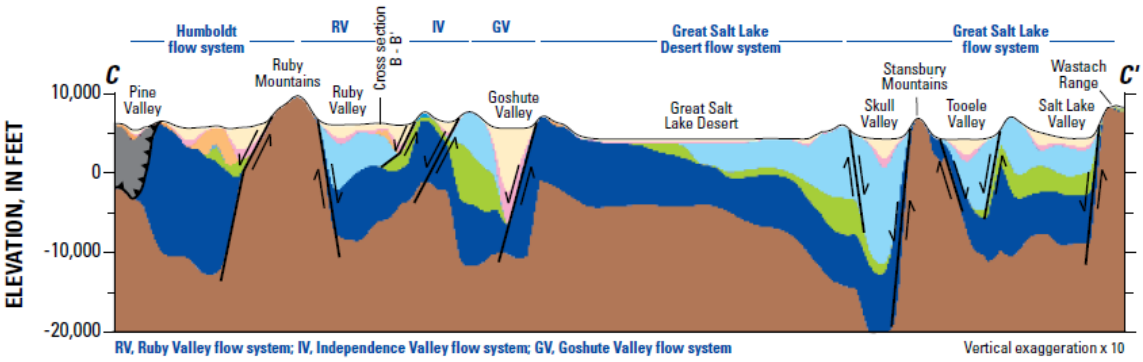


Figure 3.2-6
Geological Cross Section Through Huntington Valley (left)
(Heilweil and Brooks, 2010)
For key see Figure 3.2-4

The carbonate or limestone strata (blue in Figure 3.2-5) have negligible matrix permeability, but fractures and solution features confer secondary permeability, which is expected to be highly variable spatially. Siliciclastic rocks (quartzose metamorphic beds), lowest Tertiary volcanic rocks and crystalline rocks of the Ruby Mountains also have negligible primary permeability but some non-homogeneous fracture permeability. These older rock suites are thought (Heilweil and Brooks, 2010) to be sufficiently permeable to constitute a deep aquifer with slow-moving groundwater and some connection to the valley fill aquifers, and thought to recharge and discharge within the same basins as the shallow aquifers and surface water. As precipitation is concentrated in the highlands, groundwater recharge is primarily via alluvial systems to the valley fill and secondarily to the older rocks in the ranges.

Water Balance and Flow Rates

Upper Humboldt River Basin. Heilweil and Brooks (2010) estimate that the Humboldt River Basin system contains 800 million acre-feet of water stored in the upper valley fill (Quaternary and Hay Ranch Formation), 400 million acre-feet in the lower valley fill (Indian Well Formation), and 200 million acre-feet in the basal Tertiary volcanic rocks. They do not estimate storage in the carbonate and crystalline basement rocks because the fracture porosity is unknown, but small. Huntington Valley is approximately a tenth (9.4 percent) of the Humboldt River Basin area, and so might contain 80 million acre-feet of upper valley fill groundwater, equivalent to approximately 125 acre-feet water per acre surface area. The Elko Formation, consisting predominantly of limestone and shale (including oil shale sources of hydrocarbons) is believed to not have significant porosity or permeability.

Plume and Smith (2013) estimated that about 4,000 acre-feet per year of groundwater flows from the upper Humboldt Basin to discharge to the lower basin and the Humboldt Sink. They estimated this on the basis of transmissivity and hydraulic gradients, but this is probably biased by neglecting aquifers deeper than supply wells. The recharge rate of Heilweil and Brooks of 0.04 feet/year over 1,000 square miles (an approximate area for the Huntington Valley basin 47) would yield an estimated 25,000 acre-feet per year. The discrepancy between these estimates shows the water balance is not well constrained. Plume and Smith give the following water budget (Table 3.2-18) for the Humboldt River Basin above Carlin:

Table 3.2-18
Water Budget Components

Total Precipitation = 3.3 million acre-feet/year		
Component	**Quantity**	**Percent of Precipitation**
Evapotranspiration in basin	2.5 million acre-feet/year	75.5%
Evaporation in sink	0.47 million acre-feet/year	14%
Streamflow	0.32 million acre-feet/year	10%
Well extractions	13,000 acre-feet/year	0.4%
Groundwater seepage	4,000 acre-feet/year	0.1%

Huntington Valley Basin. Plume and Smith (2013) estimate only a partial groundwater seepage across lower Huntington Valley, at about 400 acre-feet per year (one tenth of the upper Humboldt Basin seepage). Because the valley has a low gradient through the Project Area, the groundwater velocity is quite low. If transmissivity of 1,000 ft^2/day is predominantly due to 100 feet thickness of coarse sediments with a hydraulic conductivity of 10 feet/day, gradient is 10 feet per mile and porosity of that material 20 percent, then pore velocity is just over an inch per day or 37 feet per year. This is the velocity a conservative solute (an indicator for a contaminant plume) would travel in groundwater in the supply well interval, absent any pumping well drawdown cones. The basis for this computation is:

- Hydraulic conductivity = transmissivity/permeable formation thickness (by definition)
- Hydraulic gradient is the same as the fall of Huntington Creek, 167 feet in 15 miles from south to north Project Area boundaries, or about 2 feet in 1,000 feet
- Darcy velocity = conductivity x hydraulic gradient (Darcy's Law)
- Pore velocity = Darcy velocity/porosity (Darcy velocity is "specific discharge" through a given cross section, and since water flows only in pores its particle velocity is higher than the discharge rate of the aquifer)

It may be noted that the upper valley fill aquifer as defined by Heilweil and Brooks (2010), containing all of the Quaternary alluvium and Hay Ranch Formation, is 2,000 feet thick or more over most of the Project Area, and even with significantly less transmissivity, the full thickness must convey considerably more groundwater (and have more storage) than Plume and Smith estimate in the upper 500 feet in which existing wells are completed. The decline of groundwater discharge with depth due to increased compaction of sediments and cementation can be surmised but not quantified without permeability data. The valley fill aquifer is also expected (but not described) to contain many isolating aquitards which limit vertical flow to and from the surface, so that flow becomes immeasurable at some depth.

Groundwater Quality

The water quality in all aquifers is not known, but shallow well water is adequate to support stock and domestic uses, and some irrigation is supported. Slower moving water in the lower column (deeper Quaternary and Tertiary deposits) is likely to have poor quality for agricultural or domestic use; in general, groundwater in deeper circulation paths reaches higher temperature allowing dissolution of more varied rock types.

Water wells and springs in the Project Area and vicinity were sampled and analyzed to determine baseline for major ions, trace elements, organics, and a number of constituents including tracer which might indicate possible future impacts to water quality by the Proposed Action. The same wells would be sampled later to confirm the absence of water quality impacts. The Aqua Program (sampling) is described in Appendix J. Five wells and eight springs were

sampled in April 2014 to provide baseline quality data because data was lacking for the area. This data is the basis of the following discussion. A letter from DRI documenting the methods and purpose of the baseline sampling is provided in Appendix L.

The five wells and eight springs sampled are shown on Map 3.2-4, and described in Table 3.2-19. The analyte suite is summarized in Table 3.2-20. Table 3.2-21 presents a summary of analytical data.

Table 3.2-19
Locations of Sampling Points

Site Name	Location Type	Sample Identification	Lat/Long	Date Sampled
Spring 1	Spring	Gund01Spr033114	40°29.119/-115°39.752	3/31/2014
Spring 2	Spring	Gund02Spr033114	40°29.537/-115°41.466	3/31/2014
Spring 3	Spring	Paris01Spr033114	40°31.202/-115°39.264	3/31/2014
Spring 4	Spring	Paris02Spr033114	40°30.742/-115°40.896	3/31/2014
Spring 5	Spring	Reed01Spr040114	40°31.397/-115°40.071	4/1/2014
Spring 6	Spring	Reed02Spr040114	40°31.469/-115°39.897	4/1/2014
Spring 7	Spring	ForestSpr040714	40°2913.578/-115°3524.533	4/7/2014
Spring 8	Spring	HVSpr01BLM041814	40°33'.48.9"/-115°42'41.5"	4/18/2014
Well 1	Well	GundDom033114	40°29.07.23/-115°3952.39	3/31/2014
Well 2	Well	Paris01Dom033114	40°31.362/-115°39.470	3/31/2014
Well 3	Well	ReedWell040114	40°31.445/-115°39.960	4/1/2014
Well 4	Well	BarnesHDom040114	40°22.967/-115°38.605	4/1/2014
Well 5	Well	BarnesTDom040114	40°22.879/-115°38.844	4/1/2014

Table 3.2-20
Water Quality Analytes in Data Set

Class	Analytes	Method
Major ions	Na, K, Mg, Ca; SO4, Cl	Ion chromatography
	alkalinity (bicarbonate, carbonate)	Titration
Trace elements	Ba, B, Li, Sr, F, Br	Ion chromomatography
Total dissolved solids	(TDS)	Evaporation - EPA 160.1
Organics	BTEX aromatics	EPA 8260B GC/MS
	Gasoline range organics	EPA 8015C
	Diesel range organics	EPA 8015C
	Gases - methane, ethane, propane	EPA SOP RSK-175
Indicator tracers	Alcohols (methanol, ethanol, isopropanol, glycol, ethylene glycol, glycerol, propylene glycol, 2-butoxyethanol); and acrylonitrile, persulfate	Liquid chromatography mass spec
Radiological	Radium 228	EPA 904
	Gross alpha, beta emissions	SW846 9310
Isotopes	Water D, ^{18}O; DIC ^{13}C	Isotope ratio mass spec

Table 3.2-21
Summary of Analytical Data

Constituent class, units	Analyte	Standard	Well 1	Well 2	Well 3	Well 4	Well 5	Spring 1	Spring 2	Spring 3	Spring 4	Spring 5	Spring 6	Spring 7	Spring 8
Major ions, mg/L	Sodium		36.3	15.2	33.1	30.1	22.2	55.5	51.8	35.4	18.6	59.6	103	15	201
MDL 0.24 mg/L	Potassium		3.7	nd	2.07	2.31	1.69	4.11	10	2.3	4.44	3.66	12.1	1.27	26.4
	Magnesium		8.84	6.07	6.7	7.66	8.03	7.35	16.1	8.35	1.43	13.3	29.1	3.17	20
	Calcium		36.9	29.1	30	43.4	46.4	30	70.7	33	25.1	50.9	58.4	11.8	109
	Sulfate	250 (1)	35.1	18.3	30.1	9.82	19.9	37.9	114	24.2	9.12	40.3	34	6.52	***328***
	Chloride	250 (1)	21.8	12.5	16.5	6.65	10.4	9.42	84.9	14.5	6.4	21.5	40.4	5.12	66
	Bicarbonate as calcite		132	91.5	109	170	148	168	152	144	89.6	220	379	60.9	300
General	Field pH	6.5-8.5 (2)	6.35	7.03	7.47	7.23	6.99	7.1	7.4	7.45	7.96	7.42	7.89	7.79	7.35
mg/L	Total dissolved solids	500 (2)	265	183	235	232	225	266	452	226	166	376	***571***	107	***976***
no units	Sodium adsorption ratio		1.4	0.7	1.4	1.1	0.8	2.3	1.4	1.4	0.9	1.9	2.7	1.0	4.6
Trace elements, ug/L	Barium	2,000 (1)	154	54.5	85.2	102	88	60.6	106	58.3	4.33	88.6	128	16.4	163
MDL 4.4 ug/L	Boron		76.5	20.6	45.9	59.7	83.3	112	99.5	65.1	34.4	111	194	45.7	393
MDL 2.6 ug/L	Lithium		13.3	5.4	18.1	14.1	14.1	4.3	7.3	7.2	7.03	8.84	17.2	7.44	196
	Strontium		321	174	271	291	234	229	609	227	150	330	495	92.4	92.4
MDL 60 ug/L	Fluoride	4,000 (2)	189	169	133	265	225	399	197	314	242	446	582	182	1420
MDL 113 ug/L	Bromide		140	nd	nd	122	nd	nd	424	127	nd	151	262	nd	761
Organics *MDL 0.16 ug/L*	Benzene	5 (1)	nd	nd	nd	nd	nd	nd	nd	0.166	nd	nd	nd	nd	nd
ug/L *MDL 0.17 ug/L*	Toluene	1,000 (1)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
MDL 0.16 ug/L	Ethylbenzene	700 (1)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
MDL 0.19 ug/L	Xylenes, total	10,000 (1)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
MDL 0.22 ug/L	Methane		nd	nd	nd	nd	nd	16.7	79.6	nd	nd	nd	47.4	63.5	0.64
MDL 0.57 ug/L	Ethane		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
MDL 0.56 ug/L	Propane		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
MDL 10 ug/L	Gasoline range organics		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
MDL 31 ug/L	Diesel range organics		37	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Alcohols *2 mg/L*	Methanol		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
& misc *2 mg/L*	Ethanol		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2 mg/L	Isopropanol		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
0.5 mg/L	Glycerol		nd	nd	nd	nd	nd	nd	T	nd	nd	nd	nd	nd	nd
0.5 mg/L	Ethylene glycol		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
0.5 mg/L	Propylene glycol		nd	nd	nd	nd	nd	T	T	T	T	T	nd	T	T
0.5 mg/L	2-butoxyethanol		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2 mg/L	Acrylonitrile		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1 mg/L	Ammonium persulfate		nd	nd	nd	nd	nd	T	T	T	T	nd	T	T	T
Radiometric, pCi/L	Ra-228	5 (1)	NA	NA	NA	NA	NA	0.289	0.323	0.372	0.407	0.563	0.365	NA	0.725
	Gross alpha	15 (1)	NA	NA	NA	NA	NA	4.55	6.47	9.56	3.05	***23.6***	13.5	3.03	3.39
	Gross beta	50 (1)	NA	NA	NA	NA	NA	2.09	6.37	4.13	2.59	4.23	9.38	0.243	3.88
Isotopes, δ ‰	Water D (^{2}H)		NA	NA	NA	NA	NA	-117.3	-117	-132.9	-126	-121.6	-119.4	-127.88	-130.85
	Water ^{18}O		NA	NA	NA	NA	NA	-15.28	-14.51	-16.19	-16.45	-15.61	-15.51	-16.56	-16.67
	DIC ^{13}C		NA	NA	NA	NA	NA	-14.91	-9.82	-13.37	-13.27	-13.44	-13.01	NA	NA

NOTES:

nd = less than method detection limit (MDL; indicated in left column for "nd" occurrences); T = trace, less than quantifiable limit MDL; NA = not analyzed

Sodium adsorption ratio is a a ratio of sodium to calcium and magnesium, and indicator of irrigation suitability

Isotope units are permil ratio of the heavier isotope to the lighter compared to the ratio in a standard, namely VSMOW or PDB

Standards:

Blank = no numeric standards

(1) federal MCL drinking water star ***Exceedences italicized***

2) secondary MCL ***& bold***

Six of the eight springs sampled are located in stream channels and are essentially alluvial groundwater. All five of the wells sampled were also in or adjacent to riparian areas, several near sampled springs, and these are likely to be reaches where groundwater discharges to the streams. A well in Willow Creek is said to have been artesian when drilled (field notes), indicating a high groundwater level confined by a low permeability stratum in the alluvium.

Organic Compounds

- None of the "BTEX" aromatic compounds (benzene, toluene, ethylbenzene, xylenes) was detected except for one spring sample where benzene was reported at 0.16 micrograms per liter (ug/L).
- No gasoline or diesel range organics (compounds characteristic of those fuels) were detected, except that diesel range organics were reported at 37 ug/L in one well.
- Methane was reported in five spring samples. Ethane and propane were not detected. The methane likely results from upward migration of gas produced by microbes in relatively shallow peaty deposits in the alluvial section, rather than from deeper, Tertiary strata. Natural occurrences of methane in groundwater are common where there are any strata with organic content.
- None of the seven alcohols (methanol, ethanol, isopropanol, glycerol, ethylene glycol, propylene glycol, 2-butoxyethanol,) analyzed, or acrylonitrile or ammonium persulfate was detected; there were some traces near the detection limits, and these were also reported in quality assurance blanks. These compounds might, if they were detected in samples collected after the program, indicate impacts by compounds used in well completion fluids or their breakdown products.

Major Ions. Major ions are the typical inorganic solutes in groundwater, primarily sodium (Na^{+}), potassium (K^{+}), magnesium (Mg^{2+}), calcium (Ca^{2+}), bicarbonate (HCO_3^{-}) and carbonate (CO_3^{2-}), sulfate (SO_4^{2-}) and chloride (Cl^{-}). The concentrations of these constituents in the five well and eight spring samples are shown graphically in Figure 3.2-7, which are "Stiff diagrams". On these plots, concentrations of major positive ions are represented by distance from the central axis to the left; and major negative ions are plotted to the right. The outline connects the six concentrations in a shape which conveys the relative amounts of each ion in any sample, and the area within the outline allows comparison of total solutes between samples. All of the plots are at the same scale.

- Spring 8 is distinct from all the other samples. It has considerably higher dissolved solids, and ions are dominated by sodium and sulfate.
- Spring 6 has the highest total salt concentration of the other seven springs, and Spring 7 the least of this sample set.
- Springs 1, 6, and 8 both have more sodium (upper left) than calcium, and Springs 2 and 4 have more calcium than sodium.
- All of these samples other than spring 8 have more bicarbonate (right center) than chloride or sulfate, which is typical for shallow groundwater where carbonate-bicarbonate is acquired from carbon dioxide in precipitation.
- Well samples are similar one to another, with TDS ranging from 107 to 571 milligrams per liter (mg/L), and positive ion mostly calcium but some showing equal sodium.
- Spring samples show a wider range of TDS from 107 mg/L in Spring 7 to 976 mg/L in Spring 8. Spring 7 is east of the Project Area and on the flanks on the Ruby Mountains, and probably has a short path from the point of infiltration to the spring discharge point.

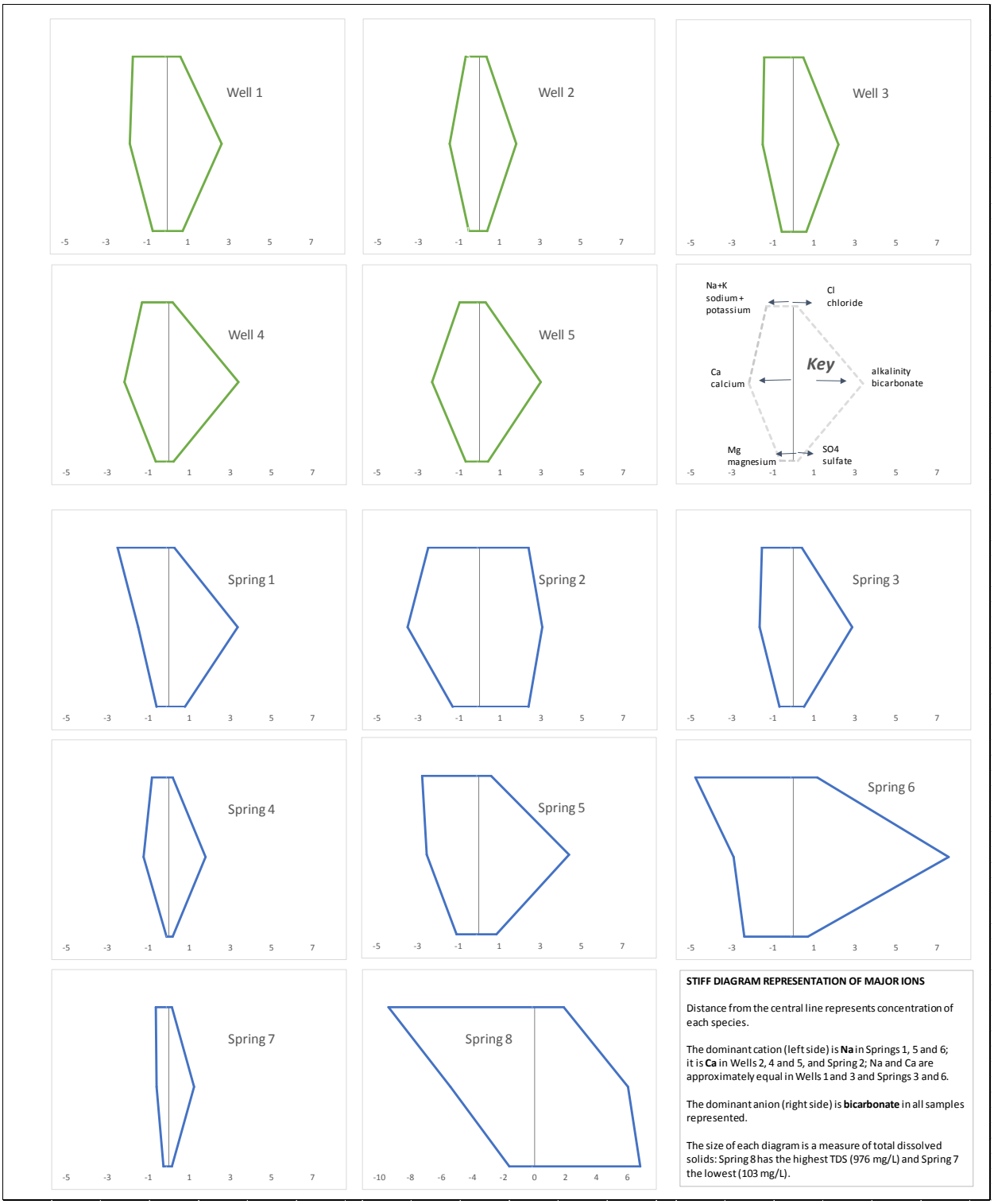


Figure 3.2-7
Stiff Diagrams Depicting Major Ion Composition of Sampled Waters

Table 3.2-21 includes sodium adsorption ratio (SAR), calculated from sodium, calcium and magnesium concentrations. This is an indicator of suitability of water for crop irrigation. All values are less than 3, except for Spring 8 (SAR 4.6). This means the potential for sodium causing soil clay swelling and permeability reduction is small in all samples except Spring 8 and would be suitable for irrigation by this criterion.

Trace elements. Barium, boron, bromide, lithium, and strontium were analyzed in these samples. Barium and strontium are alkaline earth elements like calcium and occur at about 2 percent and 8 percent, respectively, of the calcium concentration. Boron was reported at less than 200 ug/L in all samples except Spring 8, where elevated boron (393 ug/L) again indicates a deep flow path for this spring. Lithium and bromide were analyzed to establish a background against which lithium bromide tracer in completion fluids could be compared. Both lithium and bromide were reported at low levels in all samples except Spring 8, where bromide was three times as high as in Spring 7, the next highest, and lithium was 25 times the next highest value. This suggests lithium bromide may be difficult to distinguish as completion fluid tracer from deep groundwater, and this distinction may require consideration of all trace compounds where impacts might be suspected in the future. Another tracer may be used rather than lithium bromide.

Radioactive Constituents. Radium is a trace element occurring naturally in groundwater as a decay product of uranium. All radium isotopes are radioactive, and some decay to radon which is also radioactive. These and other radioactive elements (some isotopes of uranium, potassium, rubidium, strontium, iodine, etc.) do contribute natural radioactivity to some waters, and radium-228 and alpha and beta counts are common water quality analytes measured by emissions. All samples in this set showed radium less than the maximum concentration limit of 5 picocurries per liter (pCi/L) (Maximum Contaminant Level - MCL, federal drinking water standard); and less than the MCL for alpha counts (MCL 15 pCi/L) and beta counts (50 pCi/L), except that Springs 5 and 6 exceeded alpha MCL (24 and 14 pCi/L, respectively). The latter two springs have higher dissolved solids concentrations and the radioactivity again suggests longer groundwater flowpaths than for other springs, except Spring 8.

Compliance with Quality Criteria

Exceedances of federal drinking water standards in this sample set were as follows:

- Spring 5 – alpha emissions (24 pCi/L compared to MCL 15 pCi/L)
- Springs 6 and 8 – TDS (571, 976 mg/L compared to secondary standard 500 mg/L)

Isotopic Data. Stable isotopes of water and (bi)carbonate are commonly used to assess and differentiate waters. Stable, naturally occurring isotopes in water are deuterium (^{2}H) and ^{18}O, which have one or two neutrons more than the most common isotopes. The slight differences in atomic mass make slightly stronger bonds and evaporation and condensation tend to affect the heavy and light molecules differently statistically. It is assumed that water from target shale units will have substantially different isotopic signatures as compared to local groundwater because the target shale water was likely derived from precipitation that fell under different climatic conditions than more recently recharged groundwater (see Appendix L).

The labels on the points in the plot (Figure 3.2-8) correspond to the spring numbers in Table 3.2-19. The “global meteoric water line” is that of Craig (1961), with equation Y = 8*X + 10; this is an international average of isotopic concentration in precipitation and commonly used as a reference in groundwater analyses. These data are in the “cool” region of D and ^{18}O depleted rain, due to the rainout of these heavier isotopes over the Sierra Nevada Range. Values are to the right of the meteoric line due to evaporation, possibly largely due to spring storms in the valley with a lot of virga, which withdraws more ^{16}O-containing molecules by diffusion from water droplets and so pushes the droplet water to the right of the line.

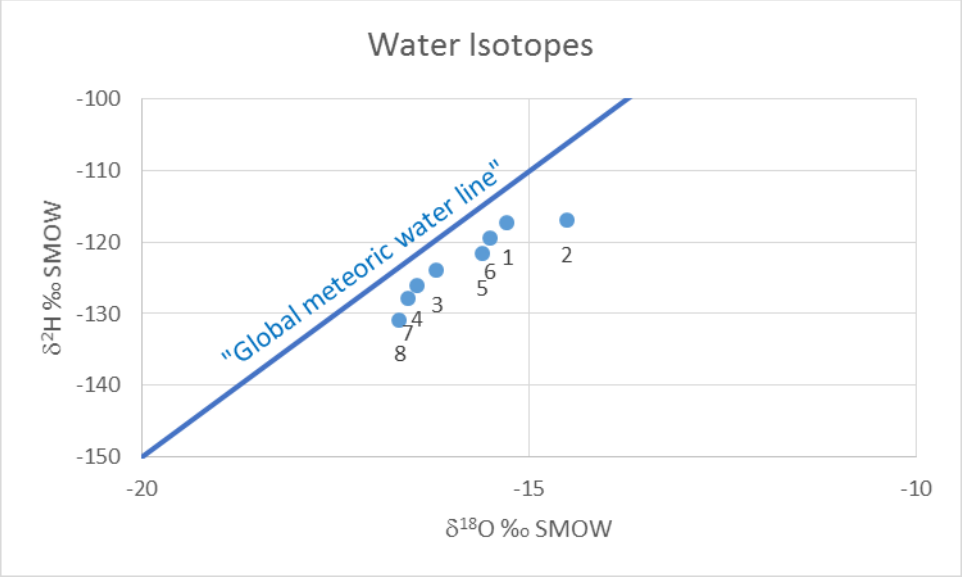


Figure 3.2-8
Water Isotope Data from Eight Springs

The stable carbon isotope ^{13}C is sometimes useful in tracing processes of inorganic carbon (bicarbonate and carbonate) in groundwater. This was analyzed in six spring samples in this sample set. Values for $\delta^{13}C$ % in dissolved inorganic carbon (DIC) were all between -13 and -15, typical for shallow bicarbonate water, except for Spring 2 where it was -9.8. This spring also has relatively high chloride and sulfate (Figure 3.2-6) and its water may have experienced some reaction effectively enriching its DIC ^{13}C (such as methanogenesis in a peaty deposit: Spring 2 showed 80 ug/L methane in solution).

This isotope data (water and DIC) may invite speculation about groundwater processes in the valley but is too sparse to develop more than a preliminary description of variability of these parameters across the Project Area. A further caveat on data from springs is that these may commonly represent mixes of more than one water (such as alluvial and bedrock) in one discharge.

Summary

In most well and spring waters sampled calcium and bicarbonate are dominant ions, with sodium equal or greater than calcium in a few. Ionic and stable isotopic compositions of water at the various locations vary, presumably due to encountering different deposits (such as peat or playa lenses) within the Quaternary alluvium.

Most water meets all drinking water standards, with minor exceedences of alpha emissions and TDS in two locations. Most sampled water would be suitable for domestic use, and all would be suitable for stock watering or crop irrigation.

Methane detected in several spring samples is presumed to be naturally occurring. No organic compounds which might be future indicators of effects of the Proposed Action were detected. Lithium and bromide ions, which are proposed to be mixed in completion water as a tracer, occur at low concentrations in some locations.

Water samples from eight springs inside and outside the Project Area were collected. These samples were to determine whether the water source for the springs were from a shallow aquifer or a deeper origin. Using the results of hydrogen and oxygen isotopic analyses, the springs show a similar source probably from shallow aquifers recharged by local precipitation. However, Spring 8 has greater concentrations of the sulfate and chloride compounds. In general terms, groundwater tends to accumulate more sulfate and chloride compounds with deeper depths and longer groundwater resident times. These concentrations may suggest a mixing of waters but more rigorous research would be needed to provide a definitive answer.

Groundwater Use

A review of the NDWR well log GIS data (NDWR, 2014a) indicates 39 water supply wells within the Project Area boundary: 16 are domestic uses, 13 are for stock watering purposes, 6 are for irrigation, and 2 are for industrial use. Two additional wells, labeled as municipal wells, are within the Project Area, one permitted to the Elko School District and one to Reed Ranching. One additional municipal well, permitted to Road and Highway Builders, is outside the Project Area but within 0.50 mile. The water supply wells are shown on Map 3.2-4.

Table 3.2-22 presents a summary of the groundwater well water rights in the Project Area (NDWR, 2014b).

Table 3.2-22
Groundwater Wells in the Project Area

Well Log Number	Owner	Location				Proposed Use	Well Finished Date	Depth (ft)		Static Water Level	Yield
								Top perf	Bottom perf		
591	Young, Roy	30N	56E	33	NE	Domestic	7/16/1948	86	104	7	12
857	Mr Cord (Ed Chapin Mgr)	29N	56E	6	SENE	Domestic	3/19/1949	100	132	20	20
1065	El Jiggs Ranch	29N	56E	4	NWNW	Domestic	9/10/1949	10	50	9	18
1066	El Jiggs Ranch	30N	56E	32	SESE	Stock Watering	9/7/1949	28	103	28	40
2768	Mound Valley School Dist	29N	56E	4	NENE	Domestic	10/28/1954	44	56	0	4
2890	Amestoy, Martin & Alfred	29N	56E	4	SENE	Domestic	3/16/1955	70	98	12	20
4265	U.S. Bureau of Land Management	31N	56E	36	NE	Stock Watering	6/4/1958	218	260	215	10
4783	Zunino Ranches	30N	56E	22	SESE	Domestic	8/5/1959	83	123	15	60
5522	Hansel, H. V.	30N	56E	16	NENE	Irrigation	2/1/1960	54	248	5	1000
5525	Hansel, H.V.	30N	56E	16	NENE	Domestic	8/12/1959	127	160	19	0
6160	Hansel, H.V.	30N	56E	16	SENE	Irrigation	5/26/1961	130	274	38.5	700
7374	Barnes, Hillery Mr. and Mrs.	29N	56E	23		Stock Watering	8/24/1963	126	136	40	0
8343	U.S. Bureau of Land Management	29N	56E	27	SWNE	Stock Watering	1/11/1965	90	120	53	20
8344	U.S. Bureau of Land Management	29N	56E	34	SWSW	Stock Watering	1/8/1964	105	242	87	15
9287	U.S. Bureau of Land Management	29N	56E	32	NESE	Stock Watering	11/2/1966	0	0	0	0
9626	U.S. Bureau of Land Management	29N	56E	32	NESE	Stock Watering	7/14/1967	355	375	350	12
9681	Vasquez, John J.	30N	56E	34	NWSW	Domestic	8/25/1967	80	110	3	30
10986	Barnes, Hillery (Hillery Barnes Livestock)	29N	56E	23		Irrigation	3/17/1970	100	240	30	450
11355	Signal Drilling Co.	29N	56E	19		Industrial	1/10/1970	160	250	160	1000
14168	U.S. Bureau of Land Management	29N	56E	16	SESE	Stock Watering	6/21/1974	160	197	112	25
19741	Wexpro Co.	29N	56E	24	NENE	Industrial	4/20/1979	18	201	12	100
20772	Reed Ranching Co.	30N	56E	4	SWNW	Irrigation	1/10/1980	140	360	0	0
23384	Young, Roy	30N	56E	33	NENE	Domestic	10/14/1981	105	120	8	30
28690	Gund Ranch	30N	56E	15	SWSW	Irrigation	2/3/1987	90	350	24	1150
30194	Gund Ranches	30N	56E	16	SENE	Irrigation	7/9/1988	75	503	5	1500

Well Log Number	Owner	Location				Proposed Use	Well Finished Date	Depth (ft)		Static Water Level	Yield
								Top perf	Bottom perf		
40754	Barnes, Harvey	29N	56E	22	NESE	Domestic	3/16/1993	105	185	62	20
46413	Peters, Lyle	30N	56E	20	SENW	Domestic	9/6/1994	160	200	55	15
48219	Reed Ranching	31N	56E	33	NESE	Public	8/7/1995	100	140	48	130
69341	Roderick, John	29N	56E	3	SESW	Domestic	11/19/1997	140	160	39	40
70481	U.S. Bureau of Land Management	30N	56E	22	NWSW	Stock Watering	11/22/1997	0	0	0	0
70701	U.S. Bureau of Land Management	30N	56E	22	NESW	Stock Watering	1/27/1998	180	210	90	10.5
83683	Elko County School District	29N	56E	4	NENE	Domestic	8/15/1963	90	136	45	0
85057	Elko County School District	29N	56E	4	NENE	Domestic	7/25/2001	100	120	28	20
88582	Elko County School District	29N	56E	4	NENE	Public	5/24/2002	10	90	25	0
91669	Zunino, Chad	29N	56E	4	NENE	Domestic	6/24/2003	105	125	25	30
98254	Paris Livestock	31N	56E	34	SESE	Domestic	7/11/2005	98	118	16	125
99627	Cumming, Joseph	30N	56E	22	SESE	Stock Watering	2/27/2006	105	145	37	20

Figure 3.2-9 shows depths of wells and post-drilling water levels in wells in the Project Area, divided into northern and southern tiers. The figure represents all data in the NDWR record, without regard to permitted status. The solid lines represent depth to water (DTW) equal to drilled depth, which would mean dry holes (water not rising in the well). Most wells are less than 250 feet deep in the Project Area, with some deeper drilled on ridges for stock and wildlife. In the southern tiers (T28N and T29N) two wells were drilled to over 300 feet and water levels are low; in four deep wells in the northern tiers (T30N and T31N) water levels rose almost to surface, suggesting drilling in low yield sediments or through a confining layer such as a tuff.

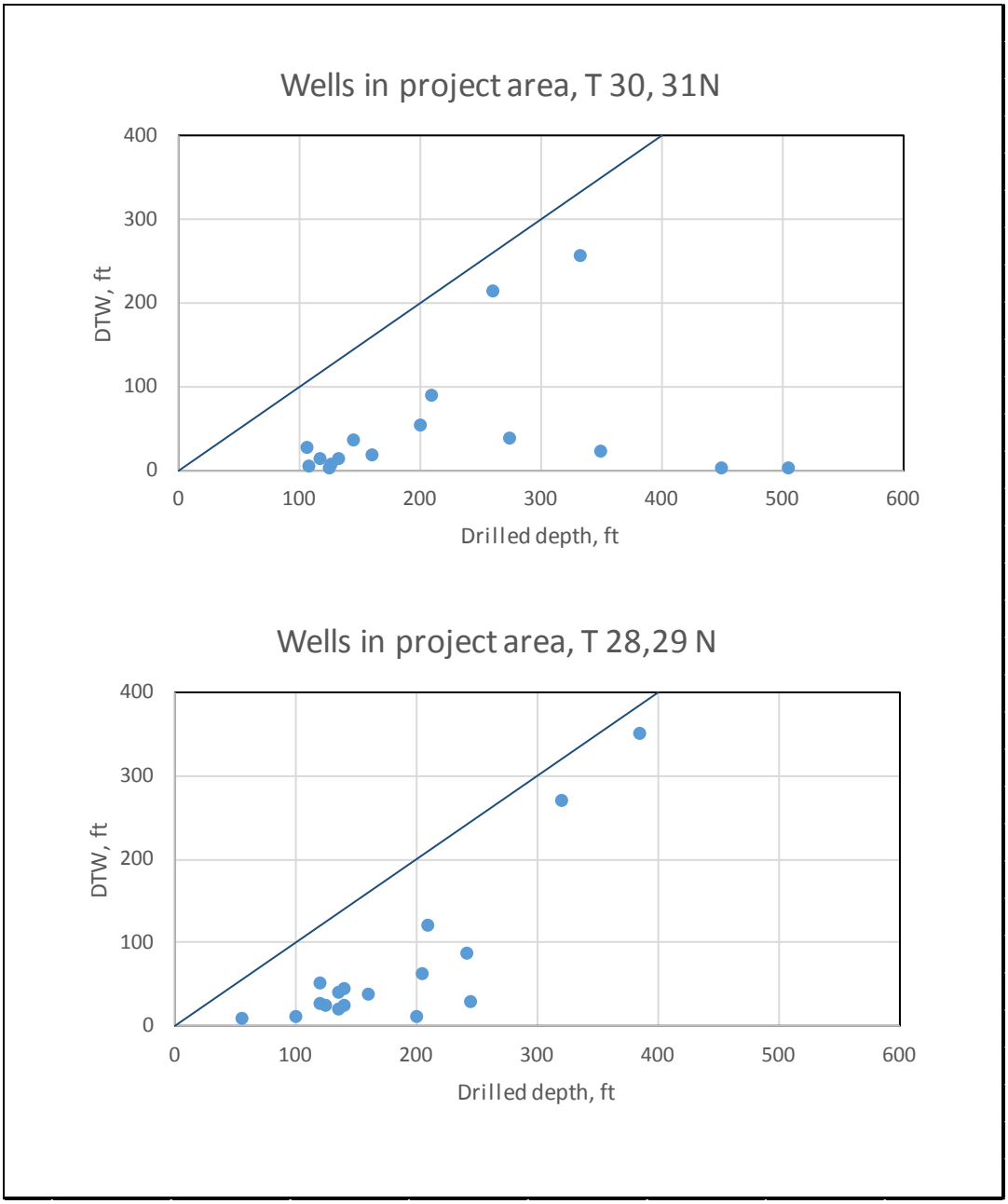


Figure 3.2-9
Depths Drilled and Water Levels in Wells in NDWR Records in Project Area

3.2.4.6 Environmental Effects – Groundwater

3.2.4.6.1 Propose Action Alternative

Impacts to groundwater could potentially occur from construction of well pads and roads, drilling and completion of wells, and from production. Potential impacts could occur from the following:

- Contamination of shallow aquifer by spills or leaks;
- Drainage (depletion) of shallow aquifer by penetrations;
- Depletion of valley fill aquifer by diversions;
- Cross-aquifer leaks via exploration/production wells;
- Escape of hydraulic fracturing fluids from the target intervals to the surface or aquifers; and
- Potential effects of underground disposal of produced water (UIC).

Contamination of Shallow Aquifer by Spills or Leaks. Spills and leaks impacting the shallow aquifer would be through infiltration of surface spills, addressed above (Surface Water), and the potential for effects is essentially the same. The Spill Prevention Plan, containments, and BMPs are designed to prevent such impacts. Leachates from cuttings have also historically been of concern as potential sources of contamination of shallow aquifers. Contamination would be prevented by following standard operating procedures as described in the Proposed Action. The water based mud used in drilling would not be expected to contain toxic materials, but the cuttings produced would be sampled before disposal to ensure they are disposed of properly. If it is determined they are non-toxic, these cuttings would be used in well pad reclamation. As proposed, these materials would be buried on-site at depths greater than 3 feet to avoid potential impacts to plant root zones. All materials would attain pertinent State of Nevada waste standards prior to on-site burial. Cuttings may also be disposed at an approved facility (Clean Harbors) located between Wendover, Nevada and Salt Lake City, Utah during exploration.

Drilling fluid balance is monitored during drilling to identify and mitigate losses to the formation. Mud loss would be quickly stopped by addition of an inert plugging agent (wood fiber and mica are commonly used). Solutes in the drilling mud that does enter the formation would be retarded by the bentonite host, but such solutes that are released into groundwater would travel at no more than the pore velocity of groundwater, estimated above to be 37 feet per year down-valley (0.7 mile in a century). An injection of tracer in the shallow aquifer (upper basin fill) at the north boundary of the Project Area might discharge to South Fork Reservoir (approximately 7 miles distant) in 1,000 years. Most mud constituents would be adsorbed to aquifer matrix in short distances, but tracer concentrations would decrease only by dilution and dispersion.

Hydraulic fracturing fluids in a well would be isolated from the shallow aquifers by three concentric, cemented casings

Drainage (depletion) of Shallow Aquifer by Penetrations. Drilling of wells through aquitards between different aquifers introduces the potential for movement of water from one aquifer to another along the well borehole. Contamination, or drainage of the shallow aquifer via leaky boreholes to lower aquifers is precluded by the casing schedule. Surface casing would be set to a minimum depth of 500 feet, well below the surface, unconfined aquifer, and cemented in before proceeding through the lower section. Intermediate and production casings triple the casing seal through the shallow aquifer.

Depletion of the Valley Fill Aquifer by Diversion. The proposed diversion of groundwater resources for drilling, hydraulic fracturing, and dust suppression purposes, could potentially lower groundwater levels temporarily. Such extractions could diminish the groundwater resource making a lower quantity of water available to groundwater users. These effects could also be

transmitted upward through the aquifer and reduce surface water flow as described above (Surface Water).

Impacts to basin groundwater levels are not expected to impact other groundwater users because under the Proposed Action only a small portion of water available in the basin would be diverted. The proposed diversion is a temporary diversion of less than 50 percent of the current estimated seepage out of the basin (400 acre-feet per year) as determined by Plume and Smith (2013), and is vastly less than the 80 million acre-feet of water estimated to be present in the upper basin fill aquifer in Huntington Valley.

An assessment of likely drawdown impacts can be made from Plume and Smith (2013) data which indicate transmissivity in existing wells in Huntington Valley averaging 670 ft^2/day (many wells testing at over 1,000 ft^2/day). Water usage can be estimated to be 12,000 cubic feet per day (ft^3/day) for dust control and 19,000 ft^3/day for drilling and completion (second year dust control estimate, and total drilling and completion use over two years), for a total of 31,000 ft^3/day (an acre-foot of water contains 43, 560 cubic feet). Assuming all that water supply came from one well, the drawdown at one half mile from that well after 100 days can be calculated from the Theis analytical solution for drawdown to be 0.1 feet in an unconfined aquifer, or 11 feet in a confined aquifer. This assumes a storage coefficient of 0.1 for an unconfined aquifer, which yields water by drainage under a free water table, or 0.001 for a confined aquifer, which yields water by aquifer compression. More simply put, pumping a single well to satisfy the entire water demand would cause estimated drawdown 0.5 mile away of at most 11 feet after 100 days steady pumping (and 16 feet in 365 days of steady pumping). Distributing pumping amongst eight wells, so that each well pumped one eighth the demand, would cause drawdown of 11/8 = 1.4 feet at that 0.5 mile distant well (in a confined aquifer) in 100 days (and 2 feet in one year). This calculation is for a project water supply well and any existing water well completed in or spring discharging from the same confined aquifer; if the project supply well is in a deeper aquifer it is likely to be completely isolated and to not impact the existing well or spring.

Cross-Aquifer Leaks via Exploration/Production Wells. The potential exists for the boreholes of proposed wells to act as conduits for water and gas to move between deep and shallow aquifers and potentially to the surface. If this were to occur, shallow aquifer water which supplies water for irrigation and domestic use could be contaminated by water and gas of naturally poor quality from deep aquifers. These cross-aquifer leaks are precluded by cemented casing sealing the well off from shallow and valley fill aquifers, and sealing the boring between them. Each piece of casing would be cemented and the cement seal tested by geophysical logs to ensure integrity. During drilling, the open section of borehole beyond the last casing would be controlled by mud pressure. Should high formation pressures be encountered greater than the mud column weight, the BOPE would be ready to cut off the drilling pipe and seal the borehole with hydraulic rams at the collar. Baseline sampling and analysis of water quality in existing wells committed to by Noble would ensure that, if there were any question of drawdown or water quality impacts due to the Proposed Action, it could be compared to prior conditions (such baseline sampling is mandatory in some states though not in Nevada).

Escape of Hydraulic Fracturing Fluids from the Target Intervals to the Surface or Aquifers. Recently, there have been claims that escape of hydraulic fracturing fluids (see Table 2.2-5 for tentative list of materials used in hydraulic fracturing), native gas, and deep groundwater could theoretically occur via the borehole, through induced fractures or via natural conduits in the subsurface. The casing and cement seals are designed to prevent borehole leakage; hydraulically induced fractures typically do not extend far (beyond a few hundred feet) from the target zone; and natural conduits for flow from the target zone should not exist. The casing schedule includes production casing to the bottom of the boring, fully cemented in place, and perforations must be made through casing and cement to allow the injection of fracturing

fluids. Fractures induced by hydraulic pressure radiate from the well, but the pressure is rapidly dissipated by the expansion of the cracks and by connection to existing formation porosity; no fracture is likely to extend more than a few percent of the overlying rock column. Finally, if natural conduits existed which allowed upward flow (such as faults or joints), the fracturing procedure would discover those leaks as pressure bleeds, and there would be no oil or gas target. It is extremely improbable there should be open fractures existing at the target depth with native rock pressure exceeding 5,000 pounds per square inch (psi) (Davis et al., 2012).

Pressure applied to hydraulically fractured rocks in a target interval dissipates radially from the well depending on what natural permeability is encountered in the path of propagating fractures, and on the carefully controlled amount of fluid pumped after initiation of the fractures. Typical fractures from target zones deeper than about 4,000 feet are vertical and may extend 100 or a few hundred feet above the perforations.

Figure 3.2-10 shows schematically the range of depths of major aquifers, existing water wells and the target zone across the Project Area, based on oil exploratory borings drilled from 1979 to 1982 in or near the Project Area. The depth of hydraulic fracturing is likely to be between 6,000 and 10,000 feet across the Project Area. The circa 1980 drillholes did encounter some hydrocarbons in Paleozoic rocks below the Elko Formation, but the focus of the Proposed Action is the Tertiary strata. Volcanic and shale layers in the Indian Well Formation are likely to cap prospective reservoirs and limit the vertical propagation of hydraulic fractures. Where such caps are absent there would be no reservoir trap or oil and no motivation to aggressively fracture rock. Such isolating strata occur throughout the Indian Well Formation, not just in the prospective oil zone.

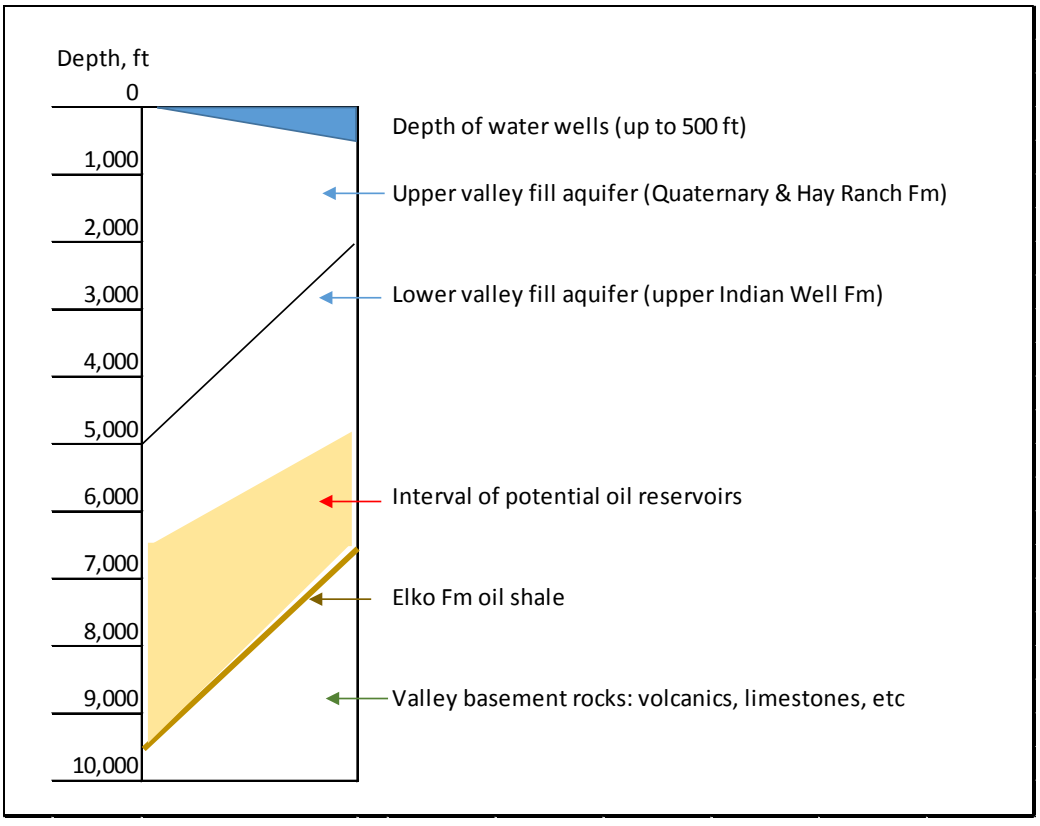


Figure 3.2-10
Schematic Showing Depths of Target Zone Relative to Aquifers Across the Project Area

Potential Effects of Underground Disposal of Produced Water (UIC). The UIC program regulates construction and operation of wells to prevent well leaks into aquifers or the shallow sub-surface. UIC wells are permitted under the federal UIC program rules administered in Nevada by the NDEP. The multiple and redundantly isolating casing strings and seals, and testing and maintenance as required under the UIC permit, would reduce the probability that waste disposal wells would impact ground and surface water. The wellhead would have storage and containment to prevent and capture potential spills. No UIC disposal well would be permitted within one mile of a fault identifiable by seismic survey or other mapping.

Mitigation and Monitoring Measures

In addition to the Project Design Features (see Section 2.2.1.6), the BLM has identified the following mitigation measures to further minimize impacts to water resources:

- Noble shall provide BLM with well logs, pump tests, monitoring of nearby water sources, and any other information needed to confirm that new diversions would not impact existing water resources.
- All water wells shall be fitted with back-flow preventers to prevent contamination of the aquifer.
- Should Noble require supplemental water due to timing of on-site water development and drilling, Noble shall provide copies of agreement with Spring Creek Utilities to the BLM prior to use of water supplied by that utility.
- A list of all chemicals (see Table 2.2-5 in Chapter 2) to be used in a hydraulic fracturing operation shall be provided. The list shall include the following: trade name, supplier, purpose, ingredients, Chemical Abstract Service Number (CAS#), maximum ingredient concentration in additive (% by mass) and/or (% by volume), and maximum ingredient concentration in hydraulic fracturing fluid (% by mass) and/or (% by volume), as directed by FracFocus data entry. The amount and type of chemicals used in the hydraulic fracturing operation shall be reported to www.fracfocus.org within 30 days of hydraulic fracturing completion for public disclosure.
- Noble shall ensure that all pressures applied during the hydraulic fracturing process shall be monitored and recorded. Recorded hydraulic fracturing pressures shall be provided to the BLM and the NDOM, if requested.
- Hydraulic fracturing fluids that are flowback from the wellbore at the conclusion of the fracturing procedure shall be placed and stored in “Baker” tanks or similar storage containments. Prior approval by the BLM or NDEP shall be obtained if an alternative storage is to be utilized. The method and location for final disposal of the flowback fluids must be approved along with the fluid quality analysis to be done.
- Prior to the hydraulic fracturing completion process Noble shall provide the BLM and NDOM the following:
    - The number of stages to be utilized.
    - Measured depth/true vertical depth to each stage.
    - The length of each stage.
    - All intervals to be perforated in measured depth/true vertical depth.

3.2.4.6.2 Well Pad K2J Access Alternative

Direct and indirect impacts associated with the Well Pad K2J Access Alternative would be similar to those described above for the Proposed Action Alternative. The additional 0.28 acre of surface disturbance would result in minimal additional impact to water resources.

3.2.4.6.3 No Action Alternative

Under the No Action Alternative, there would be no impacts from either the Proposed Action Alternative or the Well Pad K2J Access Alternative to the groundwater resources in the Project Area.

3.2.4.7 Cumulative Effects

The CESA for hydrology encompasses 833,399 acres (see Table 3.1-2 and Map 3.1-5). Between 1999 and 2013, 158,724 acres (or 19 percent) within the CESA have been impacted by fire, and various vegetation treatments have been applied to 92,201 acres (or 11 percent) (see Table 3.2-16). The surface disturbance associated with the past and present actions and RFFAs (e.g., rights-of-way, pipelines, oil and gas activities, mines) is estimated to be 14,537 acres, and when combined with the 314 acres of surface disturbance proposed for the Project, the total is 14,851 acres or 2 percent of the CESA (see Table 3.2-16). The unincorporated community of Jiggs and Spring Creek, which is a census-designated place, are also located within the CESA, as well as portions of SR 227 and 228. Cumulative effects to hydrology (i.e., sedimentation, contamination, deposition) occur as a result of these various natural and man-made factors.

In terms of groundwater, Project water use will add to groundwater extractions in the valley, where groundwater is the dominant source. The impact of the Project on this resource is small compared to existing uses. To provide perspective, some of the groundwater use in the catchment of the South Fork Humboldt River includes:

- Spring Creek Utilities Company has permits for 8,000 acre-feet/year from an 11-well field to supply the town of Spring Creek. In 2013, Spring Creek Utilities Company pumped 942,362,066 gallons into the distribution system (approximately 2,891 acre-feet) (Spring Creek Utilities Company, 2014). Other water users in the CESA would include the smaller communities of Jiggs, Smith Creek, Lucky Nugget, and the South Fork Reservation.
- Domestic and stock wells (excluding irrigation wells) in the Project Area (a fraction of the catchment) are permitted for flows up to 1,170 acre-feet/year.
- One center-pivot irrigated field on Willow Creek with an area of 86 acres, the only irrigation in the Project Area evident in 2013 imagery, would consume (at 3 feet water rating for alfalfa) 258 acre-feet/year.

Project water use for all purposes is 3 acre-feet in the first year and 23 acre-feet in the second year. The second year's projected use is about 9 percent of 2013 irrigation use in the Project Area, 2 percent of the domestic and stock use in the Project Area, and 0.3 percent of the major municipal supplier for Spring Creek. If the total groundwater extractions in the catchment are between 12,000 and 15,000 acre-feet/year, then the total project use for two years (26 acre-feet) is 0.1 – 0.2 percent of the annual existing use.

The described cumulative effects would continue under the No Action Alternative. As described above, the Proposed Action Alternative and the Well Pad K2J Alternative could result in additional impacts to water quality (surface and groundwater) and riparian areas; however, with implementation of Project Design Features, including adherence to the Stormwater Pollution Prevention Plan and Spill Prevention Plan, cumulative impacts are expected to be minimal.

3.3 BIOLOGICAL RESOURCES

3.3.1 INVASIVE, NON-NATIVE SPECIES AND NOXIOUS WEEDS

3.3.1.1 Affected Environment

NDOA (2012) has responsibility for jurisdiction, management, and enforcement of the state's noxious weed law; species on Nevada's noxious weed list should be controlled on private and public lands. However, under Invasive Species Executive Order 13112, it is the policy of the land management agencies to prevent introduction of noxious weeds, invasive and non-native species, and to control their impact. The BLM Elko District is actively engaged with the Elko Cooperative Weed Management Area (CWMA) group to help control and minimize weed infestations within Elko County. The BLM Elko District is also responsible for implementing the Integrated Weed Management Plan (see BLM, 1998). The NDOA (2001) mapped noxious weeds documented in Nevada during 1989 and 2001; Elko County had the highest density of weeds of any county. The BLM Elko District documented a rapid expansion of noxious weeds in Elko County in their Weed Inventory Report from 1998 to 2001; 13 species expanded by an average of 24 percent (BLM, 2001 as cited in Kadrmas, et al., 2002).

There are 47 noxious weed species included on Nevada's list of which 30 species are designated as Category A, nine species are Category B, and eight species are Category C weeds as defined under the Nevada Revised Statutes (NRS Chapter 555 – Control of Insects, Pests and Noxious Weeds). Category A weeds include species that are not found or are limited in distribution within Nevada that must be eradicated. Successful treatment options generally exist for these species. Category B weeds are species that may be abundant in localized areas but generally are not well established in Nevada. Reasonable treatment options for these species exist and are generally required to be treated where possible, especially in areas where populations are not well established or previously unknown to occur. Category C weeds are generally widespread and established in many counties of the state, and treatment is done at the discretion of the state quarantine officer. Elko County (2008) indicated that acreage of infestations was increasing at an alarming rate. As of 2008, at least 33 noxious and invasive weed species have been documented in Elko County.

Noxious weeds and other non-native, invasive species occurring in Elko County and within the Project Area are included in Appendix H. Opportunistic surveys for noxious weeds were conducted during October and November, 2012 by HWA (2012a). A total of 12 noxious weed and non-native invasive species were recorded in the Project Area, with Scotch thistle being the most common (see Table 3.3-1). Weeds were most commonly found along roadsides, drainages, and on the edges of agricultural land. Perennial pepperweed and hoary cress are both present in the Project Area. Several unconfirmed populations of dyer's woad were located with only basal leaves present, making it impossible to identify with certainty (HWA, 2012a). Halogeton, a non-native invasive species, is relatively common throughout the Project Area.

Table 3.3-1
Weed and Invasive Plant Species Located in the Project Area

Weed Category and Species	General Distribution in Project Area [1]	Number of Populations	Estimated Number of Individuals	Average Percent Cover	Acres
Category A					
Houndstongue *Cynoglossum officinale*	Not reported	1	51-100	1-5	0.02
Dyer's woad [2] *Isatis tinctoria*	Cottonwood Creek west of Zunino/Jiggs Reservoir	5	10-50	1-5	0.12
Category B					
Musk thistle *Carduus nutans*	Lower Huntington Creek, Smith Creek in Mound Valley	3	101-200	1-5	14.31
Scotch thistle [2] *Onopordum acanthium*	Lower Huntington Creek, Willow Creek, Mound Valley, Zunino/Jiggs Reservoir, SR 228	182	10,000-20,000	6-25	27.52
Category C					
Hoary cress [2] *Cardaria draba*	Lower Huntington Creek, Smith Creek in Mound Valley, cliffs north of Jiggs	16	5,001-10,000	6-25	2.82
Canada thistle *Cirsium arvense*	Smith Creek in Mound Valley Cottonwood Creek west of Zunino/Jiggs Reservoir	72	10,001-20,000	6-25	19.34
Poison hemlock *Conium maculatum*	Not reported	9	301-1,000	6-25	0.22
Perennial pepperweed [2] *Lepidium latifolium*	Not reported	9	3,001-5,000	6-25	0.22
Invasive Species - Not Categorized					
Crested wheatgrass *Agropyron cristatum*	Not reported				
Cheatgrass *Bromus tectorum*	Not reported				2,439
Bull thistle *Cirsium vulgare*	Smith Creek in Mound Valley, Zunino/Jiggs Reservoir	11	201-300	6-25	0.27
Halogeton *Halogeton glomeratus*	Zunino/Jiggs Reservoir, private/BLM lands west of Huntington Creek	38	>20,000	6-25	0.93

[1] Based on survey and mapping conducted in 2012 and reported by HWA (2012a).
[2] Indicates priority species identified by the BLM.

3.3.1.2 Environmental Effects

3.3.1.2.1 Proposed Action Alternative

The Proposed Action could affect abundance and diversity of invasive non-native species and noxious weeds through one or more of the following:

- Clearing native vegetation and exposing bare ground surfaces;
- Translocating weeds from established infestations to newly cleared ground by personnel vehicles and construction equipment; and
- Facilitate competition between weeds and native plants though adversely affecting native plant vigor and reproduction through dust deposition along roadsides (see discussion in Section 3.20.2.1, Vegetation).

Clearing vegetation and exposing bare ground surfaces, especially within closed canopy big sagebrush shrub communities, allows invasive species, particularly annuals, to become established at the expense of perennial bunchgrasses (West, 1988). The Proposed Action would clear vegetation to exploration/production well pads (120.0 acres) if all 20 well pads are constructed, 8.0 acres if all water well pads are constructed, gravel pits are constructed (51.0 acres), construction of new roads (76.1 acres), and upgrading existing roads (56.7 acres) totaling 314.1 acres. Surface disturbance that would be revegetated within one growing season of construction (generally in the fall) would be less likely to be infested by weeds than if left as exposed soil for longer periods. Of those areas to be disturbed, 221.6 acres would be disturbed for the long-term. Portions of those exposed surfaces would potentially be subject to establishment of noxious weeds, especially surfaces that would not be exposed to vehicle traffic for the life of the Project such as road ditches. Reclaimed surfaces, an estimated 92.5 acres, if successfully revegetated within one growing season after construction, would be less likely to become infested with invasive non-native species and noxious weeds than if revegetation is unsuccessful or marginal.

Surface disturbance, increased vehicle traffic, equipment placement and operation, foot traffic, and other activities associated with the Proposed Action could increase the distributions of established weed species and/or introduce new invasive species into areas that are not currently infested. Surface disturbance that would be revegetated within one growing season of construction (generally in the fall) would be less likely to be infested by weeds than if left as exposed soil for longer periods. Noble would revegetate/reclaim disturbance resulting from road construction within one growing season after construction and from water well pads once the water well is no longer needed, which would minimize the potential for disturbed areas to be infested with invasive and noxious weeds. Noble would implement the measures described above in Section 2.2.1.6 (Project Design Features) and the Huntington Valley Integrated Weed Management Plan (Appendix F) to minimize the abundance and spread of invasive, non-native species through prevention, monitoring, timely reclamation, and treatment. The spread of invasive species such as cheatgrass is expected to continue.

Mitigation Measures

The BLM has not identified mitigation measures in addition to the Project Design Features (see Section 2.2.1.6) which include implementation of the BLM-approved Huntington Valley Integrated Weed Management Plan to further reduce effects from invasive, non-native species and noxious weeds.

3.3.1.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts associated with the Well Pad K2J Access Alternative would be similar to those described above for the Proposed Action Alternative. The additional 0.28 acre of

surface disturbance would result in minimal additional effects from invasive non-native species and noxious weeds.

3.3.1.2.3 No Action Alternative

Under the No Action Alternative, impacts from invasive non-native species and noxious weeds associated with the Proposed Action would not occur. However, invasive species such as cheatgrass, halogeton, Canada thistle, and non-native species such as crested wheatgrass would continue to be found in the Project Area. The Integrated Weed Management Plan would not be implemented. Extensive infestations of invasive non-native species and noxious weeds would continue to limit the establishment of native perennial vegetation, decrease forage availability, and increase risk of frequent high intensity rangeland fires.

3.3.1.3 Cumulative Effects

The CESA for invasive, non-native species and noxious weeds encompasses 833,399 acres (see Table 3.1-2 and Map 3.1-5). Between 1999 and 2013, 158,724 acres (or 19 percent) within the CESA have been impacted by fire, and various vegetation treatments have been applied to 92,201 acres (or 11 percent) (see Table 3.2-16). The surface disturbance associated with the past and present actions and RFFAs (e.g., rights-of-way, pipelines, oil and gas activities, mines) is estimated to be 14,537 acres, and when combined with the 314 acres of surface disturbance proposed for the Project, the total is 14,851 acres or 2 percent of the CESA (see Table 3.2-16). The unincorporated community of Jiggs and Spring Creek, which is a census-designated place, as well as portions of SR 227 and 228, are also located within the CESA.

The Proposed Action, combined with past, present, and reasonably foreseeable surface disturbance, has the potential to create conditions favorable for the establishment/invasion of non-native invasive species and noxious species. Disturbed sites and recently seeded areas are candidates for invasion by undesirable species. The current pattern of weed distribution (i.e., concentrated along roads and by water sources) indicates dispersal by vehicles and livestock. Increased vehicular traffic could increase noxious weed spread. Wildland fire poses the greatest risk for future invasion of non-native invasive species and noxious species within the CESA. Other disturbance includes oil and gas exploration, dispersed recreation (i.e., hunting, camping, etc.), off-highway vehicle use, and mining. These effects would continue under the No Action Alternative. Implementation of the Project Design Features would minimize the likelihood of the Proposed Action spreading or introducing invasive non-native species/noxious weeds within the Project Area and watershed; therefore, no incremental increase in cumulative effects is expected to occur over what is already occurring.

3.3.2 VEGETATION

3.3.2.1 Affected Environment

The Project Area is mapped based on the NRCS ecological site descriptions (NRCS, 2013b). Ecological site descriptions represent a common, standardized approach to classify, describe, and map land capability and interpret ecosystem processes and response at local scales. The expected vegetation associated with the ecological sites is listed in Table 3.3-2 and shown on Map 3.3-1. The three dominant vegetation types in the Project Area include: Wyoming big sagebrush with bluebunch wheatgrass (74.6 percent), Wyoming big sagebrush with basin wildrye (8.3 percent), and Willow dominated lowlands (7.0 percent).

Table 3.3-2
NRCS Ecological Site Descriptions within the Project Area

Ecological Site ID	Ecological Site Species Composition	Existing Vegetation in Project Area (acres)	
		Area	Percent of Total Area
R024XY059NV	Juniper (*Juniperus osteosperma),* Wyoming big sagebrush (*Artemisia tridentata* var. *wyomingensis*), bluebunch wheatgrass (*Pseudoroegneria spicata*)	68.4	0.1
R024XY060NV	Pinyon Pine (*Pinus monophylla*), Juniper, black sagebrush (*Artemisia nova*), bluebunch wheatgrass, indian ricegrass (*Achnatherum hymenoides)*	304.2	0.5
R025XY019NV	Wyoming sagebrush, bluebunch wheat grass, Thurber's Needlegrass (*Achnatherum thurberianum*)	47,340.2	74.6
R025XY014NV	Big sagebrush (*Artemisia tridentata* var *tridendata*), bluebunch wheatgrass, Thurber's needlegrass	2,975.7	4.7
R024XY006NV R025XY003NV	Wyoming big sagebrush, basin wildrye (*Leymus cinereus*)	5,258.9	8.3
R024XY007NV R024XY008NV	Greasewood (*Sarcobatus vermiculatus),* basin wildrye	1,086.0	1.7
R025XY012NV	Wyoming big sagebrush, antelope bitterbrush (*Purshia spp.*), idaho fescue (*Festuca idahoensis*), bluebunch wheatgrass	260.3	0.4
R025XY017NV	Little sagebrush (*Artemisia arbuscula*), Idaho fescue-bluebunch wheatgrass	133.3	0.2
R024XY009NV	Alkali sacaton (*Sporobolus airoides*), scratchgrass (*Muhlenbergia asperifolia*)	1,534.2	2.4
R025XY001NV	Willow (Salix spp.), beardless wildrye (Leymus triticoides), basin wildrye *(Leymus cinereus*)	4,446.2	7.0
N/A	Water	87.6	0.1
	Total	**63,495.0**	**100.0**

The characteristic vegetation in the Project Area typically includes the following grass species: Bluebunch wheatgrass, Thurber's needlegrass, Sandberg bluegrass, basin wildrye, Indian ricegrass, bottlebrush squirreltail and western wheatgrass. Inland saltgrass, alkali sacaton, and mat muhly are common on saline bottoms. However, grasslands in the Project Area are dominated by cheatgrass (HWA, 2012a). Other sites that have been disturbed by agriculture and ranching/livestock operations would be classified as invasive annual grasslands (Lowry et al., 2005) and, if vegetated, are dominated by cheatgrass and non-native crested wheatgrass. Disturbed areas, particularly surrounding Zunino/Jiggs Reservoir, are dominated by non-native invasive species. Agricultural fields have been developed in riparian zones and floodplains

within the Project Area and support introduced, non-native species, including orchardgrass and timothy, used as hay for livestock feed.

Vegetation surveys were conducted within the Project Area by HWA (2012a) to describe the current status of the vegetative community. Historical grazing, farming, and other anthropomorphic impacts have changed the plant community compositions from the expected descriptions presented in Table 3.3-2. Wyoming big sagebrush shrublands were documented as the most extensive vegetative growth form in the Project Area (68.2 percent), which is in accordance with expected coverage based on the NRCS Ecological Site Descriptions (Table 3.3-3). However, species compositions have changed (Map 3.3-2, Table 3.3-3); Wyoming big sagebrush is the current and expected dominant species, but underlying grass species (including invasives) have reduced coverage bluebunch wheatgrass and Thurberg's needlegrass. Other mapped shrublands within the Project Area vary by associations of other woody shrub species, particularly rubber rabbitbrush, and/or Douglas rabbitbrush, with Wyoming big sagebrush.

Table 3.3-3
Vegetation Types, General Characteristics, and Coverages within the Project Area

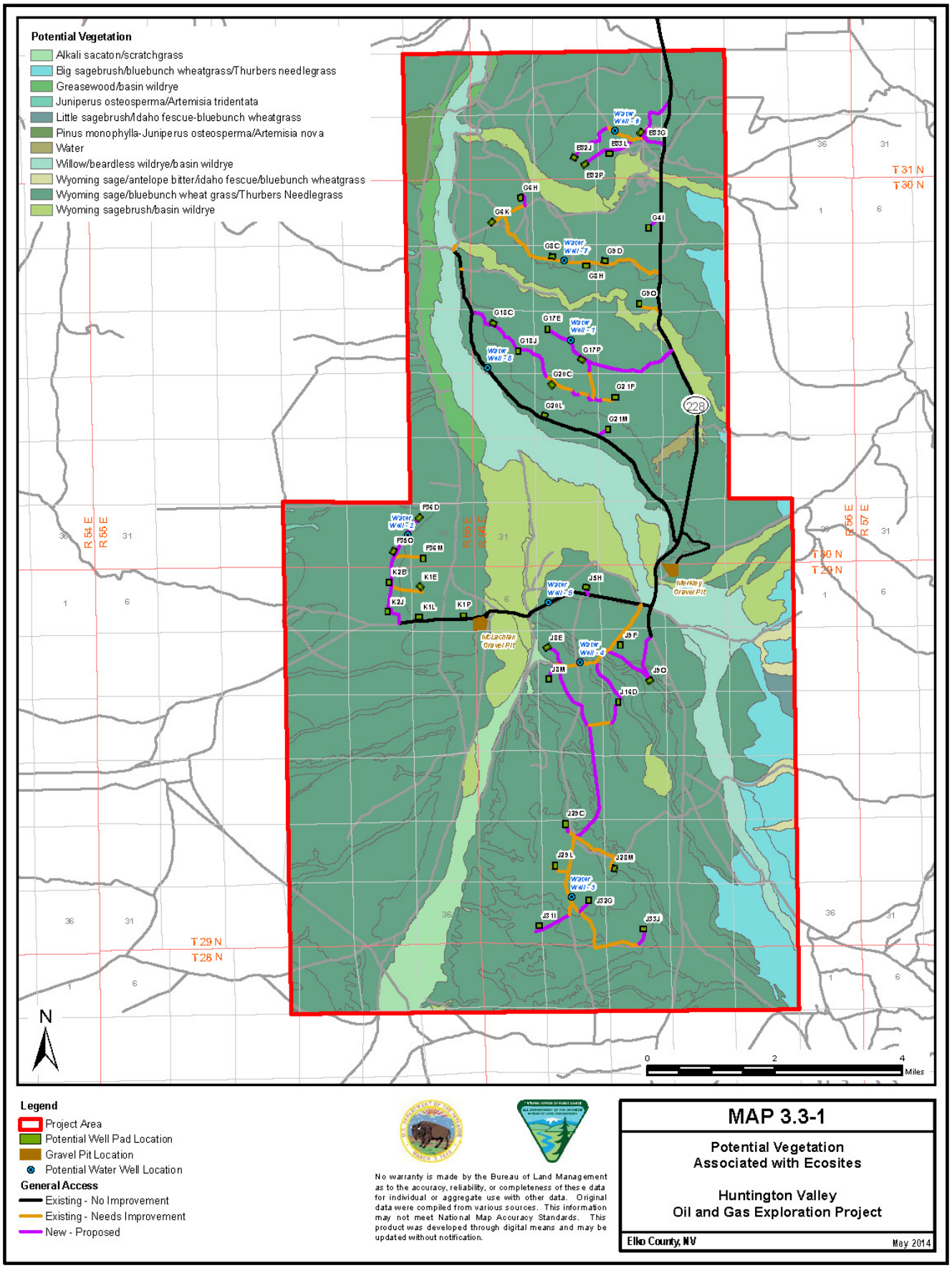
General Vegetation Type[1]	Dominant Species [1]	Description[1]	Estimated Shrub Cover[2]	Existing Vegetation in Project Area (acres)	
				Area	Percent of Project Area
Juniper	Juniper, needleandthread (*Hesperostipa comata),* spiny phlox (*Phlox hoodii)*	Juniper forests on rocky, barren soils with sparse bunch grasses and forbs.	Not estimated	957.5	1.5
Juniper – Sagebrush	Juniper, Wyoming big sagebrush, Sandberg bluegrass (*Poa secunda*), Indian ricegrass	Juniper intermixed with sagebrush, with more developed soils and denser grasses than the Juniper class.	40 to 50 percent	1,555.8	2.5
Big Basin Sagebrush	Basin big sagebrush	Dominated by dense, tall sage; most prevalent in drainages and along riparian corridors.	Not estimated	1,380.7	2.2
Sagebrush Community	Wyoming big sagebrush, rabbitbrush (*Ericameria nauseosa* and *Chrysothamnus viscidflorus*), Sandberg bluegrass	Lower density of grasses compared to sagebrush/ grassland, but otherwise similar to sagebrush/grassland.	5 to 45 percent	514.8	0.8
Sagebrush-Grassland	Wyoming big sagebrush, rabbitbrush, Sandberg bluegrass, Indian ricegrass, needleandthread, bluebunch wheatgrass, lupine (*Lupinus* sp), spiny phlox	Most common vegetation type on rolling hills throughout the Project Area.	5 to 25 percent	43,296.7	68.2
Sagebrush-Rabbitbrush	Basin big sagebrush, Wyoming big sagebrush, crested wheatgrass (*Agropyron cristatum*), rabbitbrush, cheatgrass (*Bromus tectorum*)	Sagebrush; crested wheatgrass common near agricultural areas; common in drainages and low lying areas.	5 to 60 percent	6,123.3	9.6
Rabbitbrush-Grassland	Rabbitbrush, Indian ricegrass	Typically on ridges and hilltops, on sandier soils.	30 to 35 percent	29.3	<0.05
Greasewood	Greasewood, basin big sagebrush	Low lying alkaline areas dominated by dense greasewood, with big basin sagebrush sometimes co-dominant.	20 to 30 percent	264.2	0.4

General Vegetation Type[1]	Dominant Species [1]	Description[1]	Estimated Shrub Cover[2]	Existing Vegetation in Project Area (acres)	
				Area	Percent of Project Area
Grass Dominated	Cheatgrass, needleandthread	Dominated by cheatgrass with some bunch grasses present.	5 to 15 percent	561.7	0.9
Disturbed	Russian thistle ((*Salsola tragus*), Scotch thistle (*Onopordum acanthium*), curlycup gumweed (*Grindelia squarrosa*), prostrate knotweed (*Polygonum aviculare*), horehound (*Marrubium vulgare*)	Predominantly recreation areas near Zunino/Jiggs Reservoir and ranches.	0 to 20 percent	92.8	0.1
Agriculture	Orchardgrass (*Dactylis glomerata*), timothygrass (*Phleum pratense*), bluegrass (*Poa* sp.)	Hay fields present along riparian corridors throughout the Project Area.	Not estimated	7,779.4	12.3
Riparian	Sandbar willow (*Salix melanopsis*), sedges (*Carex* sp.), rushes (*Juncus* sp.), Canada thistle (*Cirsium canadensis)*	Hydrology has been altered in some areas by agriculture.	Not estimated	665.1	1.0
Reservoir	Foxtail barely (*Hordeum jubatum*), sandbar willow, curly dock (*Rumex crispus*)	Dry and mostly vegetated during surveys.	Not estimated	114.0	0.2
Bare ground	None	Either sand dunes or areas of high intensity livestock use.	Not estimated	159.7	0.3
			Total	**63,495.0**	**100.0**

[1] HWA, 2012a.
[2] HWA, 2013c.

HWA estimated shrub cover and shrub height during surveys conducted in spring 2013 (HWA, 2013c) (Table 3.3-3). Growth characteristics of Wyoming big sagebrush vary where samples were evaluated. Sagebrush cover was generally more extensive (average 19 to 22 percent cover) and sagebrush was generally taller (average height 19 to 29 inches) in the Sagebrush Community type than in the Sagebrush/Grassland type (average cover 12 percent, average height 12 to 27 inches). Sagebrush cover was lower (average 17 to 22 percent cover) in the Sagebrush/Rabbitbrush Mix type but sagebrush was generally taller (average 21 to 33 inches).

Woodlands composed of Utah juniper occur on rocky soils at higher elevations in the southern portion of the Project Area and are scattered on steep slopes near the northern border, primarily on south-facing slopes. Juniper woodlands, intermixed with sagebrush, are present in the same general portions of the Project Area but occur mostly on lower slopes and/or on north-facing slopes. Heights of juniper trees ranged from 10 feet to 15 feet.



Legend

- Project Area
- Potential Well Pad Location
- Gravel Pit Location
- Potential Water Well Location

General Access

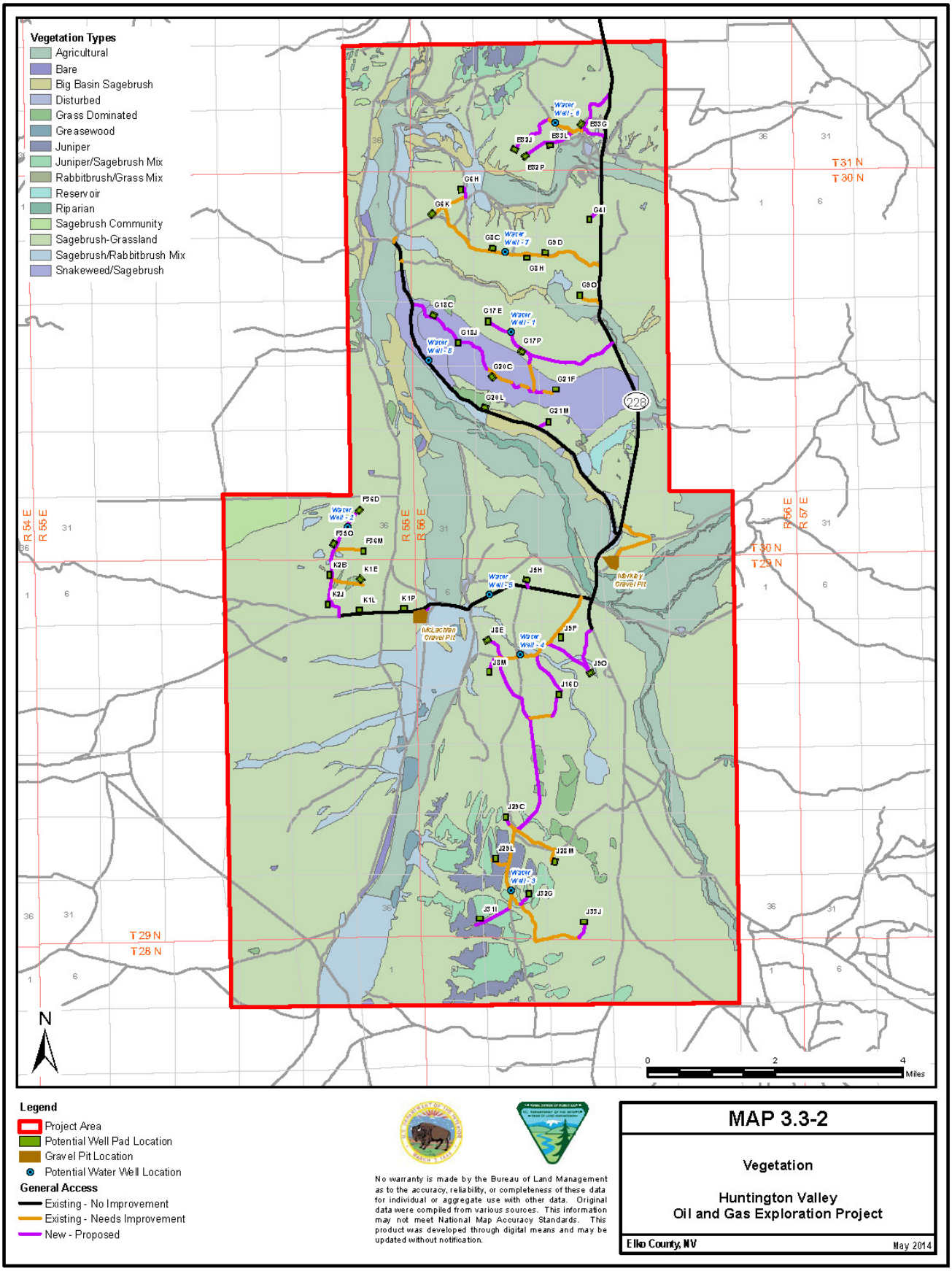
- Existing - No Improvement
- Existing - Needs Improvement
- New - Proposed

MAP 3.3-1

Potential Vegetation Associated with Ecosites

Huntington Valley Oil and Gas Exploration Project

Elko County, NV — May 2014



Legend

- Project Area
- Potential Well Pad Location
- Gravel Pit Location
- Potential Water Well Location

General Access

- Existing - No Improvement
- Existing - Needs Improvement
- New - Proposed

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

MAP 3.3-2

Vegetation

Huntington Valley
Oil and Gas Exploration Project

Elko County, NV — May 2014

3.3.2.2 Environmental Effects

3.3.2.2.1 Proposed Action Alternative

The Proposed Action could directly or indirectly affect vegetation through one or more of the following pathways:

- Direct removal of vegetation during clearing and grading well pads and roads.
- Damage or mortality of plants by dust deposited on photosynthetic surfaces during construction and operation.
- Changes in herbivory by domestic and/or native herbivores caused by displacement from affected areas or attraction to newly re-vegetated sites.
- Introduction or an increase in invasive and noxious weeds could alter vegetation cover and species composition, potentially out-competing native plant species.

Table 3.3-4 lists the proposed surface disturbance by ecological site type. The table shows a potential of 428.1 acres of disturbance identified for 39 exploration/production well pads and associated roads; however, actual disturbance would not be more than 314.1 acres (Table 2.2-4) with construction of only 20 well pads and associated roads. It is not known which 20 of the 39 exploration/production well pads and associated roads would be constructed and therefore, all are represented in Table 3.3-4 as potential disturbance. Nearly all of the Project effects would be in Ecological Site R025XY019NV; however, the 427.5 acres identified for disturbance amounts to 0.9 percent of the total area of Ecological Site R025XY019NV within the Project Area.

Table 3.3-4
Potential Effects to Ecological Site Types
in the Project Area (39 Exploration/Production Well Pads)

Ecological Site ID	Ecological Site Species Composition	Vegetation in Project Area (acres)	Potential Total Disturbance (acres)	Percentage of Project Area (acres)
R024XY059NV	Juniper, Wyoming big sagebrush, bluebunch wheatgrass	68.4	0.0	0.0
R024XY060NV	Pinyon Pine, Juniper, black sagebrush, bluebunch wheatgrass, indian ricegrass	304.2	0.0	0.0
R025XY019NV	Wyoming big sagebrush, bluebunch wheatgrass, Thurber's needlegrass	47,340.2	427.5	0.67
R025XY014NV	Big sagebrush, bluebunch wheatgrass, Thurber's needlegrass	2,975.7	0.0	0.0
R024XY006NV R025XY003NV	Wyoming big sagebrush, basin wildrye	5,258.9	0.1	<0.001
R024XY007NV R024XY008NV	Greasewood, basin wildrye	1,086.0	0.0	0.0
R025XY012NV	Wyoming big sagebrush, antelope bitterbrush, Idaho fescue, bluebunch wheatgrass	260.3	0.0	0.0
R025XY017NV	Little sagebrush, Idaho fescue-bluebunch wheatgrass	133.3	0.0	0.0
R024XY009NV	Alkali sacaton, scratchgrass	1,534.2	0.1	<0.001
R025XY001NV	Willow, beardless wildrye, basin wildrye	4,446.2	0.4	<0.001
N/A	Water	87.6	0.0	0.0
	Total	**63,495.0**	**428.1**	**0.67**

Table 3.3-5 lists the potential effects to vegetation types in the Project Area based on 39 identified exploration/production well pads; however, under the Proposed Action, only 20 of the 39 identified exploration/production well pads would be constructed. Although Table 3.3-5 shows a potential 428.1 acres of disturbance, actual disturbance would not be more than 314.1 (Table 2.2-4) acres. It is not known which 20 of the 39 exploration/production well pads and associated roads would be constructed and therefore, all are represented in Table 3.3-5 as potential disturbance. It is likely that project disturbance would have the greatest effects to the sagebrush-grassland vegetation (see Table 3.3-5). Most of the potential disturbance described in Table 3.3-5 would be to those two vegetation types as well as to juniper-sagebrush and sagebrush-rabbitbrush mixed vegetation (and minor disturbances within basin big sagebrush and grass-dominated vegetation) having some expected levels of shrub cover provided by basin big sagebrush, Wyoming big sagebrush, and/or rabbitbrush. Surface disturbances within juniper woodlands and within agricultural lands are not expected to affect existing shrub cover (see vegetation descriptions in Table 3.3-3). Nearly all of the project effects would be in Sagebrush Grassland. However, the 351.2 acres identified for disturbance amounts to 0.8 percent of the total area of Sagebrush Grassland within the Project Area, similar to the effects to Ecological Site R025XY019NV noted above.

Table 3.3-5
Potential Effects to Vegetation Types
in the Project Area (39 Exploration/Production Well Pads)

General Vegetation Type[1]	Estimated Shrub Cover [2]	Existing Vegetation in Project Area (acres)	Potential Surface Disturbance by Vegetation Type (acres)	
			Potential Total Disturbance	Percentage of Project Area Disturbed
Juniper	Not estimated	957.5	2.4	<0.001
Juniper – Sagebrush	40 to 50 percent	1,555.8	16.3	0.03
Big Basin Sagebrush	Not estimated	1,380.7	0.6	<0.001
Sagebrush Community	5 to 45 percent	514.8	0.0	0.0
Sagebrush-Grassland	5 to 25 percent	43,296.7	353.1	0.56
Snakeweed –Sagebrush	Not estimated	1,966.7	40.8	0.07
Sagebrush-Rabbitbrush	5 to 60 percent	4,156.6	5.5	0.01
Rabbitbrush-Grassland	30 to 35 percent	29.3	0.0	0.0
Greasewood	20 to 30 percent	264.2	0.0	0.0
Grass Dominated	5 to 15 percent	561.7	9.0	0.01
Disturbed	0 to 20 percent	92.8	0.0	0.0
Agriculture	Not estimated	7,779.4	0.4	<0.001
Riparian	Not estimated	665.1	0.0	0.0
Reservoir	Not estimated	114.0	0.0	0.0
Bare Ground	Not estimated	159.7	0.0	0.0
Total		**63,495.0**	**428.1**	**0.68**

[1] HWA, 2012a.
[2] HWA, 2013c.

Direct effects to vegetation could occur through damage or mortality to individual plants as a result of decreased light transmission due to dust deposited directly on leaves or other photosynthetic surfaces could occur due to increased traffic along existing roads during construction and operation. Dust from construction and related traffic could impair photosynthesis, gas exchange, transpiration, leaf morphology, and stomata function (Farmer, 1993; Sharifi et al., 1997; Rai et al., 2009). Dust from construction and related traffic could also interfere with plant reproduction by disrupting pollinator activities and plants' physiology (Lewis, 2013). Noble would control fugitive dust on the access roads and within disturbed surfaces which would minimize effects to adjacent vegetation. Additionally, speed limits would be enforced from the beginning of construction throughout the life of the Project, and where speed limits are not posted on unpaved access roads, speeds would not exceed 20 mph, which would minimize fugitive dust.

Indirect effects to vegetation might occur if the Proposed Action displaced native and domestic herbivores, causing excessive browsing and/or grazing on vegetation resources that otherwise would not occur. Alternatively, herbivores could be attracted to unaffected vegetation adjacent to newly revegetated locations, causing excessive browsing and/or grazing following restoration. This impact could be minimized by fencing highly vulnerable areas until reclamation is successful.

Indirect effects to native vegetation could occur if invasive, non-native species became established in cleared, disturbed areas and resulted in infestations that might limit or prohibit growth of native and/or desirable species. Weed seeds or cuttings of some species could be transported naturally (wind and water) or accidentally (vehicles or other equipment) to disturbed areas. Weed seeds may be present in the native soil materials and the removal of vegetative cover and soil disturbance might promote weed establishment at the expense of desirable species. Approximately 92 acres of the proposed disturbance (based on 20 exploration/production well pads) would be temporary disturbance (reclaimed after construction). Noble would reclaim 2.5 acres of the 6.0 acre disturbance for exploration/production well pads after drilling and completion and prior to the well being placed in production (totaling 50 acres). Temporary road disturbances would be reclaimed within at least one growing season of ground disturbance. Water well pads totaling 8.0 acres would be reclaimed when the water well is no longer needed. Timely reclamation of temporary disturbances would minimize disturbed substrate availability for invasive non-native species and noxious weed establishment. Noble would follow measures described above in Section 2.2.1.6 (Project Design Features) to minimize effects to native vegetation from invasive, non-native species as well as those described in the Huntington Valley Integrated Weed Management Plan (Appendix F) and the Huntington Valley Reclamation Plan (Appendix G).

Mitigation Measures

The BLM has not identified mitigation measures in addition to the Project Design Features (see Section 2.2.1.6) which include implementation of the BLM-approved Huntington Valley Integrated Weed Management Plan and a BLM-approved Reclamation Plan to further reduce effects to vegetation.

3.3.2.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts associated with the Well Pad K2J Access Alternative would be similar to those described above for the Proposed Action Alternative. An additional 0.28 acre of surface disturbance would be disturbed under this alternative; however, 0.29 acre of vegetation within the 3-mile lek buffer of the Branzell Lek would not be removed under this alternative.

3.3.2.2.3 No Action Alternative

Under the No Action Alternative, there would be no impacts from either the Proposed Action Alternative or the Well Pad K2J Access Alternative to vegetation within the Project Area.

3.3.2.3 Cumulative Effects

The CESA for vegetation encompasses 833,399 acres (see Table 3.1-2 and Map 3.1-5). Between 1999 and 2013, 158,724 acres (or 19 percent) within the CESA have been impacted by fire, and various vegetation treatments have been applied to 92,201 acres (or 11 percent) (see Table 3.2-16). The surface disturbance associated with the past and present actions and RFFAs (e.g., rights-of-way, pipelines, oil and gas activities, mines) is estimated to be 14,537 acres, and when combined with the 314 acres of surface disturbance proposed for the Project, the total is 14,851 acres or 2 percent of the CESA (see Table 3.2-16). The unincorporated community of Jiggs and Spring Creek, which is a census-designated place, as well as portions of SR 227 and 228 are also located within the CESA as well as portions of SR 227 and 228.

Cumulative effects that could impact vegetation within the CESA include: wildland fire, oil and gas exploration, dispersed recreation (i.e., hunting, camping, etc.), grazing, increased invasive and noxious weed presence, and OHV use. These effects would continue under the No Action Alternative. Within the CESA, the Proposed Action and the Well Pad K2J Access Alternative would add to the cumulative effects already occurring due to other forms of multiple use; therefore, cumulative effects would occur. With implementation of mitigation measures described above, cumulative impacts resulting from the Proposed Action Alterative and the Well Pad K2J Access Alternative would be minimal.

3.3.3 MIGRATORY BIRDS

3.3.3.1 Affected Environment

The Migratory Bird Treaty Act (MBTA) of 1918, as amended, implements treaties for the protection of migratory birds. EO 13186, issued in 2001, directed actions that would further implement the MBTA. As required by MBTA and EO 13186, BLM signed a MOU with the USFWS in April 2010, which is intended to strengthen migratory bird conservation efforts by identifying and implementing strategies to promote conservation and reduce or eliminate adverse effects to migratory birds.

At the project level, the BLM should:

- Evaluate the effects of their actions on migratory birds and identify where take reasonably attributable to those actions may have a measureable negative effect on migratory bird populations,
- Develop conservation measures and ensure monitoring or the effectiveness of the measures to minimize, reduce or avoid unintentional take,
- Consider approaches to the extent practicable for identifying and minimizing take that is incidental to otherwise lawful activities including:
    - altering the season of activities to minimize disturbances during the breeding season,
    - retaining the integrity of breeding sites, especially those with long histories of use, and
    - coordinating with the USFWS when planning projects that are likely to have a negative effect on migratory bird populations and cooperating in developing approaches that minimize negative impacts and maximize benefits to migratory birds.

The BLM's conservation efforts focus on migratory species and some non-migratory game bird species that are listed as Birds of Conservation Concern (BCC). BCC have been identified by

the USFWS (2008) for different Bird Conservation Regions (BCR) in the United States. The entire Project Area is in BCR 9 of the Great Basin region. Twelve species listed as BCC within BCR 9 have either been observed (six species) or potentially occur within the Project Area (Table 3.3-6) based on their known distributions and habitat associations in the Great Basin (Ryser, 1985) and western Colorado (Righter et al., 2004).

Table 3.3-6
Birds of Conservation Concern within Bird Conservation Region 9 (Great Basin) that May Occur in the Project Area

Common Name Scientific Name	Habitat [1]	Observed On-site [2]	BCR Trend [3] 1966 to 2011	Local Trend [4] 1993 to 2012
Bald eagle *Haliaeetus leucocephalus*	Forested areas adjacent to large bodies of water. Winter foraging includes big game winter ranges	Yes	Increasing	No Data
Ferruginous hawk *Buteo regalis*	Nests in isolated trees, rock outcrops, artificial structures, and ground near prey base.	Yes [5]	No Trend	Insufficient Data
Golden eagle *Aquila chrysaetos*	Nest on open cliffs and in canyons or in tall trees (cottonwoods) in open country and riparian zones.	Yes	No Trend	Insufficient Data
Long-billed curlew *Numenius americanus*	Nests in grassy areas close to marshes but also dry upland areas, alkali flats.	Yes	No Trend	Insufficient Data
Lewis' Woodpecker *Melanerpes lewis*	Often associated with burned pine forests, pinyon pine and juniper woodlands	No	No Trend	Insufficient Data
Willow Flycatcher *Empidonax trailli*	Moist, shrubby areas often with standing or running water, including streams in broad valleys	No	Declining	Insufficient Data
Loggerhead shrike *Lanius ludovicianus*	Present in desert shrublands, juniper woodlands; hunts over bare ground or short vegetation.	Yes	No Trend	Declining
Pinyon jay *Gymnorhinus cyanocephalus*	Pinyon-juniper woodland most but also in sagebrush and scrub oak in foothills and mid elevations	No	Declining	Declining
Sage thrasher *Oreoscoptes montanus*	Valleys, foothills, mesas in big sagebrush shrublands; nests in shrub or ground beneath shrub.	No	No Trend	Declining
Green-tailed towhee *Pipilo chlorurus*	Open pinyon-juniper woodlands with shrub-dominated under stories, primarily sagebrush	No	No Trend	Insufficient Data
Brewer's sparrow *Spizella breweri*	Closely associated with big sagebrush shrublands; nests in sagebrush, forages on ground.	Yes	No Trend	Declining
Sage sparrow *Amphispiza belli*	Close associate of big sagebrush shrublands; nests in shrub close to ground, forages on ground.	Yes	No Trend	No Trend

[1] Based on Righter et al., 2004; Ryser, 1985.
[2] HWA, 2012b and HWA, 2013a.
[3] Sauer et al., 2011.
[4] Linear trends of birds counted per route, averaged for data available on 11 BBS routes within 100 miles surrounding the Project Area in Nevada and Utah between 1993 and 2012. Data from Sauer et al., 2011.
[5] Inactive nests were observed on-site but no birds were present.

Population trends of BCC have been compiled within the Great Basin BCR and analyzed using National Breeding Bird Survey (BBS) data (Sauer et al., 2011) compiled from 11 BBS survey routes within 100 miles surrounding the Project Area in Nevada and Utah. The data show that the bald eagle population in BCR 9 has increased since 1996 but pinyon jay populations in BCR 9 and in the local area have declined. Likewise, local populations of loggerhead shrikes, sage thrashers, and Brewer's sparrows have declined during the past 20 years (Table 3.3-6). Species' common and scientific names used in the text and tables are provided in Appendix M.

Fifty-six bird species were observed during on-site surveys in 2012 and 2013 (HWA, 2012b, HWA, 2013a). Of those, 52 species are listed as Nearctic and Neotropical migratory birds by the USFWS, Division of Bird Habitat Conservation, and protected under the MBTA (USFWS, 2010a). All species observed on BBS routes within 100 miles of the Project Area during the past 20 years and species observed within the Project Area during 2012 and 2013 are included in Appendix N along with designation as Species of Conservation Priority under the Nevada Wildlife Action Plan.

A total of 152 bird species protected under the MBTA have been observed on 11 BBS routes within 100 miles surrounding the Project Area in Nevada and Utah (Appendix N). Some species have been observed on a few occasions and other species are common. Trends for seven species within the region indicate their populations have been declining over the past 20 years while the population of one species appears to be increasing. House finch, Brewer's sparrow, sage thrasher, pinyon jay, common nighthawk, killdeer, and American kestrel are species with declining populations in the region surrounding the Project Area. All seven species are known or likely to occur in habitats within the Project Area. Yellow warbler, which typically inhabits riparian willow thickets, is the only species with an increasing population in the surrounding area (see Appendix N).

Surveys for nesting raptors were conducted in 2013. Within the Project Area and a surrounding 1-mile buffer, 38 nest sites were documented including: one burrowing owl nest, three ferruginous hawk nests, four great horned owl nests, one red-tailed hawk nest, and 21 unknown raptor nests. In addition to the hawk and owl nest sites, eight corvid nests were found including three common raven nests, four black-billed magpie nests, and one American crow nest.

Nesting chronologies for the migratory bird species observed on-site, including the BCC, were compiled from data available for Nevada (Great Basin Bird Observatory, no date). The median earliest breeding date for species reported within the Project Area is May 8 (earliest is January 19 for golden eagles). The nesting cycle, through fledging young, is expected to be completed for all species of migratory birds seen in the Project Area by September 21 (median fledging date is August 11).

3.3.3.2 Environmental Effects

3.3.3.2.1 Proposed Action Alternative

The USFWS has primary responsibility for administering the MBTA, which prohibits taking, killing, or possessing migratory birds, their parts (feathers, talons), nests or eggs. EO 13186 directed federal agencies to avoid take under the MBTA, whether intentional or unintentional (with BCC as priorities), and implementing conservation measures to restore and enhance habitat for migratory birds, including the development of surface operating standards for oil and gas developments, management of invasive species to benefit migratory birds, minimizing/preventing pollution, or detrimental alteration of habitats utilized by migratory birds, among other commitments.

Effects to migratory birds could result from one or more of the following:

- Removal of nesting and foraging habitat during the core nesting season (March 15 – July 31);
- Active nest abandonment and nestling mortality resulting from disturbances (noise, human activity);
- Permanent loss of shrub cover reducing nesting cover and substrate for birds;
- Degradation of nesting habitats due to invasive and noxious weed infestations that could alter native vegetation cover and plant species composition.
- Collisions with project vehicles along project access roads as well as highways leading to the area; and
- Poisoning resulting from the ingestion of toxic chemicals.

In the 2010 MOU pursuant to EO 13186, the BLM committed to identify where take under the MBTA could be reasonably attributable to agency actions that could have a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors. Avoidance implementing actions during nesting season is one approach to lessening take. The BLM suggested that impacts to nesting migratory birds could be minimized or avoided by imposing a timing limitation on use authorizations to mitigate vegetative disturbing activities during the primary portion of the nesting season (March 15 to July 31) when most migratory birds nest, but cautioned that dates should be adjusted for the timing or intensity of breeding activity by BCC and migratory bird species affected by the Project, and species' environmental conditions (BLM, 2007a). As discussed in the BBCS (JBR, 2013b), if vegetation clearing is planned during the core nesting period (March 15 through July 31), surveys would be conducted 7 to 10 days prior to clearing. If nests are found within areas where vegetation would be removed, surface disturbances would not occur until after July 31. If no nests are found, clearing would be possible with no timing limitation if conducted with 14 days of the survey.

Construction during the core nesting season could result in abandonment of active nests, displacement of birds, and possible mortality of nestlings, more likely early in the nesting season (egg laying, incubation) rather than late in the season (Romin and Muck, 2002). Most species will re-nest following a nesting failure although the number of nesting attempts or re-nesting intensity varies among species (Marten and Geupel, 1993). However, it should be noted that "taking an individual, nest, or eggs of a migratory bird is unlawful under the MBTA, whether or not the species will re-nest. Risk of mortality of nestlings and dependent fledglings is greater if adults abandon nests late in the season or nests are destroyed prior to fledging young, and could increase if predators are attracted to areas occupied by humans (Andren, 1994; Chalfoun et al., 2002). Displacement of nesting migratory birds from adjacent nesting habitats due to noise, human activity, and dust associated with oil and gas activities could also occur (Ingelfinger and Anderson, 2004; Knick and Rotenberry, 2002) within a "zone of effect" surrounding project components including well pads (including production facilities) and roads. Displacement/avoidance may be short-term if related to noise and human presence or long-term if related to habitat removal, alteration, and/or fragmentation (Gilbert and Chalfoun, 2011).

Disturbances (noise, human activities) to nesting raptors can lead to nest abandonment and nestling mortality (Romin and Muck, 2002). The USFWS (Whittington and Allen, 2008) and the BLM have developed spatial and temporal buffers to protect active raptor nest sites listed in Table 3.3-7. Adherence to the temporal and spatial buffers would minimize effects to active nest sites.

Permanent loss of shrub cover after implementing the Proposed Action could reduce nesting cover and substrate for birds, especially for sagebrush and shrub-nesting obligates such as the BCC and other passerine species noted above. Other migratory birds nest on the ground, often near clumps of grass or other objects (e.g., horned lark, savannah sparrow, vesper sparrow, western meadowlark).

Table 3.3-7
Temporal and Spatial Buffers Recommended by the BLM for Raptor Species that Could Occur in the Project Area

Raptor Species	Breeding Season Timing Buffer[1]	Breeding Season Spatial Buffer (mile)[2]
Bald Eagle	January 1 - August 31	1.0
Burrowing Owl[3]	March 1 - August 31	0.25
Ferruginous Hawk	March 1 - August 1	0.5
Golden Eagle	January 1 - August 31	0.50
Great Horned Owl	December 1 - September 30	0.25
Northern Harrier	April 1 - August 15	0.25
Prairie Falcon	April 1 - August 31	0.50
Red-tailed Hawk	March 15 - August15	0.25
Short-eared Owl	March 1 - August 1	0.25
Swainson's Hawk	March 1 - August 31	0.25

[1] Based Romin and Muck, 2002.
[2] Based on Whittington and Allen, 2008.
[3] NDOW recommends that the timing buffer for burrowing owls be extended until September 30. Although young have likely fledged by August 31st, burrowing owls are dependent on their burrows throughout the season and disturbance to the burrows should be limited.

As described in Section 3.3.2 (Vegetation), surface disturbances affecting vegetation types that provide some shrub cover (including juniper-sagebrush, sagebrush-grassland, sagebrush-rabbitbrush vegetation types; see Table 3.3-3) would remove potential nesting substrates provided by basin big sagebrush, Wyoming big sagebrush, and rabbitbrush. Successful revegetation of approximately 92 acres of disturbance (interim reclamation of well pads and temporary disturbance for roads) is expected to occur within three growing seasons of construction, which should provide nesting and/or foraging habitat for some passerine migratory species; however, reestablishment of sagebrush would be longer. Under natural succession regimes it would take at least 20 years to replace sagebrush that might provide suitable nesting substrates for BCC and other migratory bird species.

The Proposed Action could affect bird species through degradation of nesting habitats due to invasive and noxious weed infestations that could alter native vegetation cover and plant species composition. Implementation of the measures included in the Integrated Weed Management Plan (Appendix F) would minimize weed infestations.

Mortality of adult birds can potentially occur if they select hollow metal and plastic pipes (PVC – polyvinyl chloride), or posts to nest in and become trapped. Mortality can also occur if birds use exhaust stacks on production facilities to perch, roost, or nest and become trapped, poisoned by carbon monoxide, or incinerated (BLM, 2013b). As included in the BBCS (JBR, 2013b), all open pipes would be capped or filled to prevent birds from becoming trapped and all exhaust stacks would be screened and outfitted with anti-perching devices to prevent bird entry and to discourage perching, roosting, and nesting. Caps and screens would be checked regularly to ensure they are effective.

Additionally, noise produced by machinery and other human activities may interfere with bird vocalizations used for territory establishment, mate attraction and selection, food begging, and predator alarms (Marler, 2004). Use of reasonable, prudent, and effective measures such as

using suitable mufflers on all internal combustion engines and use of only authorized access could also reduce potential impacts to migratory birds. Incidental take of active nests, if it occurs, is not expected to have measurable negative effects on migratory bird populations.

Noble has prepared a BBCS (JBR, 2013b) with the following goals:

- Reduce the potential for avian and bat injury or mortality by implementing specific actions;
- Identify and isolate where avian and bat mortality has occurred or has the potential to occur to minimize future incidents;
- Establish an avian and bat reporting system to document incidents of mortality caused by electrocution, heat, collision, and other project-related features; and
- Assist Noble in compliance with state and federal laws regarding avian and bat species to avoid the threat of penalties and fines.

The measures included in the BBCS and the above discussion of effects are listed in Section 2.2.1.6 (Project Design Features). With implementation of the measures in the BBCS, effects to migratory birds is expected to be minimal.

Mitigation Measures

In addition to the Project Design Features (see Section 2.2.1.6), the BLM has identified the following mitigation measure to further reduce potential impact to migratory birds:

- Raptor and corvid perching and nesting deterrents shall be placed on all aboveground structures to reduce potential predation on migratory birds and their nestlings, including BCC.

3.3.3.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts associated with the Well Pad K2J Access Alternative would be similar to those described above for the Proposed Action Alternative. The additional 0.28 acre of surface disturbance would result in minimal impact to migratory birds.

3.3.3.2.3 No Action Alternative

Under the No Action Alternative, there would be no change from the Proposed Action to habitats used for nesting and shelter by BCC and other migratory birds within the Project Area. No potential take of migratory birds, eggs, or nests or displacement of birds from otherwise suitable nesting habitats due to noise and human activities caused by the Proposed Action would occur. Populations of several species, including sagebrush obligate BCC (Brewer's sparrow and sage thrasher), would likely continue declining under the No Action Alternative with the reduction of sagebrush steppe habitats due to wildfires and to infestations of invasive species such as cheatgrass that limit the establishment of native perennial vegetation and increases risk of frequent high intensity rangeland fires. Populations of other migratory bird species with broader habitat associations would likely continue to remain stable in the region.

3.3.3.3 Cumulative Effects

The CESA for migratory birds encompasses 833,399 acres (see Table 3.1-2 and Map 3.1-5). No direct or indirect impacts would occur to migratory birds outside of this CESA boundary. Between 1999 and 2013, 158,724 acres (or 19 percent) within the CESA have been impacted by fire, and various vegetation treatments have been applied to 92,201 acres (or 11 percent) (see Table 3.2-16). The surface disturbance associated with the past and present actions and RFFAs (e.g., rights-of-way, pipelines, oil and gas activities, mines) is estimated to be 14,537 acres, and when combined with the 314 acres of surface disturbance proposed for the Project, the total is 14,851 acres or 2 percent of the CESA (see Table 3.2-16). The unincorporated

community of Jiggs and Spring Creek, which is a census-designated place, as well as portions of SR 227 and 228, are also located within the CESA.

Migratory birds (primarily passerine species plus waterfowl and shorebirds) are generally protected and/or avoided for any activities on public land but may not be protected for actions on private land. Past, present, and reasonably foreseeable activities within the CESA that could affect nesting habitats for migratory birds include: community development, wildland fire, livestock grazing, noxious weed proliferation, oil and gas exploration, dispersed recreation (i.e., hunting, camping, etc.), and off-highway vehicle use. Impacts to migratory birds have or would result from the following: 1) destruction of habitat associated with road building; 2) disruption from human presence or noise such as construction equipment, four wheel drive pickups or OHVs; or 3) direct impacts/harm to migratory birds that would result if ground nests were destroyed by construction, ranching equipment or trampling by cattle. There are no specific data that quantify impacts to migratory birds as a result of grazing or recreation. However, impacts to migratory birds from recreation activities would include destruction of native vegetation or nesting areas from off road vehicles that traveled off of established roadways. Impacts to migratory birds from grazing include trampling and consumption of vegetation of nesting areas near streams, springs, or riparian areas. Impacts from wildland fire would include total destruction of the existing habitat and potential alteration of the habitat thereafter.

Livestock grazing and associated management may contribute to the spread of invasive non-native species and noxious weeds which can have an indirect effect on migratory bird habitat. In addition, recreational travel routes can create habitat fragmentation and disturbance to vegetation structure. However, disturbance to migratory birds from past and present actions would have been reduced through reclamation and habitat enhancement seedings of disturbed areas or suboptimal areas and natural recolonization of native species. The past and present actions that are quantifiable have disturbed only a small portion of the CESA (less than 2 percent).

Cumulative impacts to migratory birds and their habitat from the Proposed Action would be mainly the removal of vegetation, or destruction of habitat, and noise. Regional data for three BBC that are sagebrush obligate species indicate their populations are declining. Cumulative effects, including the Proposed Action Alternative, the Well Pad K2J Access Alternative, and reasonably foreseeable actions, could contribute to habitat loss and/or alteration and could further affect populations of sagebrush obligate species. These impacts would be minimized through implementation of the protective measures in the Bird and Bat Conservation Strategy. Cumulative impacts to migratory birds as a result of the Proposed Action Alternative or the Well Pad K2J Access Alternative when added to the past and present actions and RFFAs are expected to be minimal.

3.3.4 SENSITIVE AND SPECIAL STATUS SPECIES

3.3.4.1 Affected Environment

3.3.4.1.1 Special Status Animal Species

ESA-Listed Species

The (USFWS, 2013a) identified four species listed as threatened or endangered under the Endangered Species Act (ESA) as occurring within Elko County. They include the endangered Independence Valley speckled dace, endangered Clover Valley speckled dace, threatened bull trout in the Jarbidge River Distinct Population Segment (DPS), and threatened Lahontan cutthroat trout (LCT). In addition, there is one species proposed for listing as threatened - yellow-billed cuckoo, western United States DPS – and two candidate species - the greater

sage-grouse, and the Columbia spotted frog – that could occur within the Project Area. Species' common and scientific names used in the text and tables are provided in Appendix M.

Neither the Independence Valley speckled dace nor the Clover Valley speckled dace occur in the Project Area; they inhabit isolated impoundments or springs approximately 35 to 55 miles northeast (USFWS, 1998). Bull trout occur within Elko County within the Jarbidge River drainage, a tributary to the Snake River in Idaho. There is no hydrologic surface connection to the Humboldt River and bull trout do not occur in the Project Area.

Yellow-billed Cuckoo. The USFWS (2013b) proposed listing the yellow-billed cuckoo, western DPS that nests west of the Continental Divide, as threatened under ESA. The western DPS includes birds that nested in western Nevada along the lower Truckee and Carson rivers and in southern Nevada along the Colorado and Virgin rivers. Yellow-billed cuckoos have been detected in the Pahranagat Valley and Key Pittman Wildlife Area, both in Lincoln County (USFWS, 2013b). Yellow-billed cuckoos are considered a riparian obligate species and are usually found in large tracts of cottonwood/willow habitats with dense sub-canopies, but may also be found in urban areas with tall trees (USFWS, 2007). Its presence in Elko County has been predicted (Nevada Natural Heritage Program - NNHP, no date) but not in the South Fork Humboldt Watershed (NatureServe, 2013). Suitable habitat is not present in or adjacent to Project Area and the species is not expected to occur.

Lahontan Cutthroat Trout. LCT, a federally listed threatened species, occur in a number of streams near the Project Area and within the larger area in the project vicinity (Map 3.2-4). Prior to 1990, LCT occupied several streams within the Project Area including Cottonwood Creek, Smith Creek, McCutcheon Creek, Gilbert Creek, and Carville Creek (NNHP, 2014 based on records from NDOW). Other historically occupied streams in the Project Area included populations in Huntington Creek, Willow Creek, Corral Creek, and Robinson Creek (USFWS, 2009). Although these drainages support viable populations (BLM and NDOW GIS file data), most occupied habitat occurs upstream of the Project Area on lands administered by the Forest Service. Although LCT may sporadically occur in the lower reaches of these streams on private lands, only the upper reaches are considered occupied and as having potential for recovery (USFWS, 1995; NDOW, 2005). Cutthroat trout likely historically occurred in Huntington Creek, located within the Project Area; however, poor habitat conditions make this stream unsuitable for LCT (BLM file data). There is the potential for the species to occur in the Project Area in high water years; however, due to the nature of the drainage and current impacts from grazing and drought, any occurrence would be unlikely and temporary and LCT are not analyzed further.

ESA Candidate Species

Columbia Spotted Frog. Columbia spotted frogs were petitioned for listing under the ESA in 1989 and populations, including those in Nevada, were found to be declining due the extensive loss and alteration of wetland habitat. The USFWS (1993) found that listing the Great Basin population (and others) under the ESA was warranted but precluded by other priorities and designated the species as a candidate. The Ruby Mountain subpopulation of Columbia spotted frog is disjunct from other subpopulations in Nevada. The Ruby Mountain subpopulation inhabits several pond habitats within the Middle Fork and South Fork of Smith Creek which for the Smith Creek Conservation Unit. Columbia spotted frogs are also present in beaver ponds in Corral Creek and its tributary Green Mountain Creek which are part of the Isolated Streams, Ruby Mountains Conservation Unit (Columbia Spotted Frog Technical Team, 2003). Spotted frogs in Rattlesnake Creek are also included in the Isolated Streams Conservation Unit but Rattlesnake Creek does not flow through the Project Area whereas lower reaches of Smith Creek and Corral Creek pass through the Project Area and are tributaries to Huntington Creek. A portion of the Ruby Mountain subpopulation overlaps the Project Area east of Jiggs and SR 228. Most

occupied habitats are within the Humboldt-Toiyabe National Forest, outside of the Project Area, except for an occupied site on Corral Creek (Columbia Spotted Frog Technical Team, 2003) which is within the Project Area boundary. No records of occupied habitat within the Project Area were provided by the NNHP (2014).

Greater Sage-Grouse. After a 12-month review, the USFWS (2010b) found that listing the greater sage-grouse as threatened or endangered under the ESA throughout its range was warranted but precluded by higher priority listing actions. The USFWS indicated that listing the greater sage-grouse under the ESA will be proposed in the future but for the present the species is a candidate for listing. Consistent with the National Greater Sage-Grouse Conservation Measures (Sage-grouse National Technical Team, 2011), the BLM as the lead agency, together with the Forest Service as a cooperating agency, is preparing several EISs, with associated plan amendments to establish sage-grouse conservation measures. These documents will address a range of alternatives focused on specific conservation measures across the range of the greater sage-grouse (BLM and Forest Service, 2013). The current project falls within the Nevada and Northeastern California Greater Sage-Grouse EIS.

Greater sage-grouse historical habitat distribution data has been kept by NDOW. In March 2012, NDOW updated their greater sage-grouse habitat mapping to include five habitat categories. Habitats in Category 1 and 2 have the highest conservation value to maintaining sustainable greater sage-grouse populations (NDOW, 2012). NDOW has not established management directives based on their habitat categorization; they promote the habitat categories as the best available information for use in planning and decision-making by land management agencies (NDOW, 2012).

On March 15, 2012, the BLM issued a White Paper on greater sage-grouse habitat on lands managed by the BLM and the Forest Service (BLM, 2012a). The paper states that the BLM and the Forest Service will focus on two categories of greater sage-grouse habitat including PPH Preliminary Priority Habitat (PPH) and Preliminary General Habitat (PGH). Areas of PPH or PGH indicate where land-use changes could result in a negative impact to greater sage-grouse population health. BLM's classification of greater sage-grouse habitats in the Project Area is limited to federal land. The BLM (2012b) has classified PPH and PGH in the Project Area on public lands. The BLM used the NDOW Habitat Categories 1 through 3 to determine PPH and PGH habitat types as follows:

- PPH consists of NDOW Habitat Category 1 (Essential and Irreplaceable Habitat) and Category 2 (Important Habitat). The NDOW Habitat Categories consist of breeding habitat, lek sites, nesting habitat, brood-rearing habitat, winter range, and movement corridors. Habitat for greater sage-grouse primarily consists of sagebrush; however, it can include riparian areas, perennial grassland, agricultural land, and restored land.
- PGH consists of NDOW Habitat Category 3 (Moderate Importance). This habitat type is similar to PPH although it typically lacks one or more key components that prevent it from being categorized as primary habitat. For example, sagebrush and understory may be present yet of insufficient height. This habitat type also includes sagebrush communities with pinyon-juniper encroachment, unrecovered burn areas, and areas that lack bird survey and inventory data to support a higher ranking.
- NDOW Habitat Category 4 (Low Value Habitat and Transitional Range) consists of areas that contribute very little habitat value to greater sage-grouse other than transitional range from one seasonal habitat to another or minimal foraging use. These habitat types include salt desert shrub communities, natural pinyon/juniper woodlands, aspen stands, and mountain mahogany stands. BLM did not utilize this category.

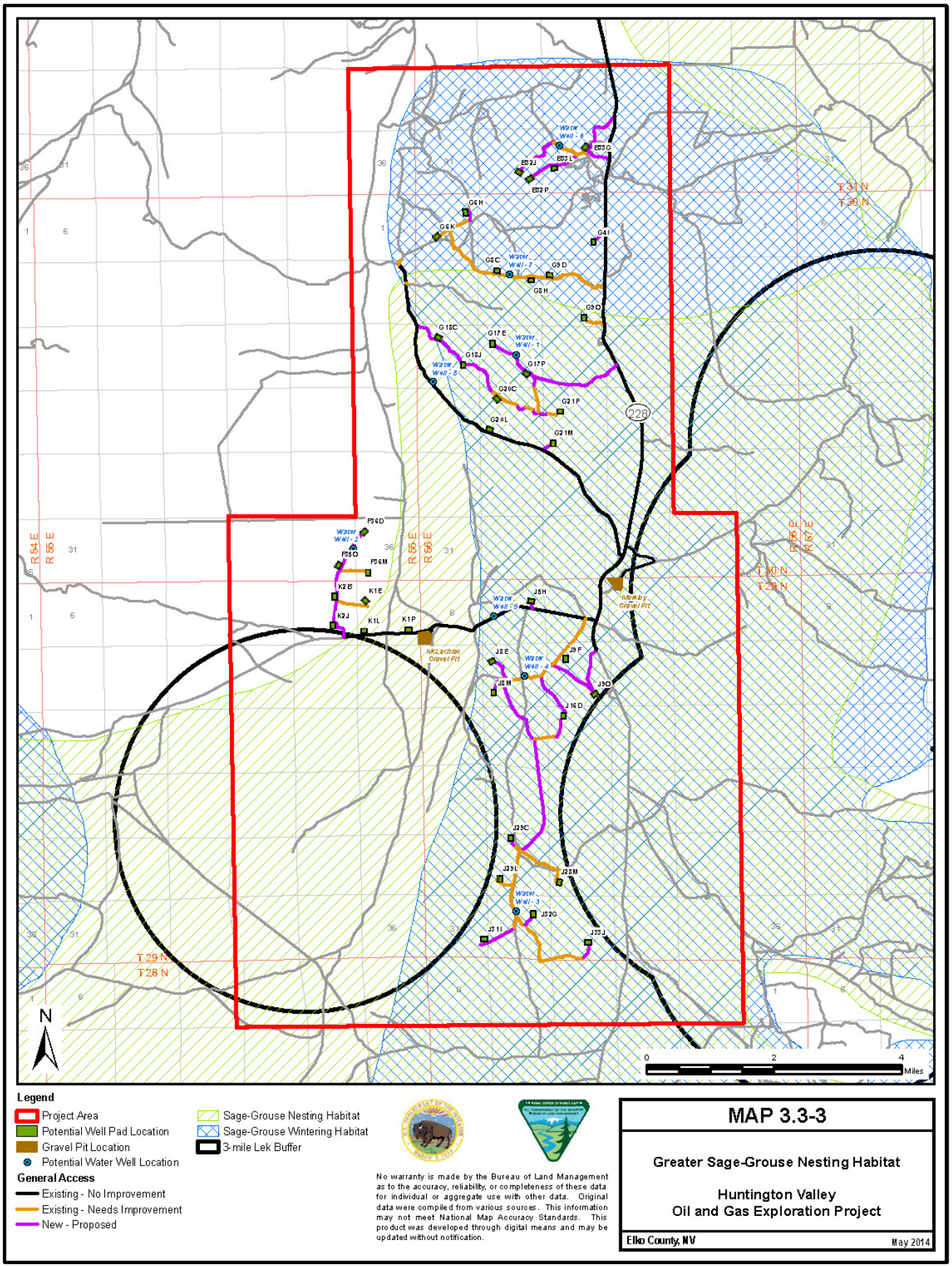
- NDOW Habitat Category 5 (Unsuitable Habitat) consists of areas currently in such poor condition that restoration efforts would not be feasible. BLM did not utilize this category.

BLM PPH (also NDOW Habitat Category 1 and 2) coincides with 12,208.0 acres or 19 percent of the Project Area. BLM PGH (also NDOW Habitat Category 3) coincides with 20,747.4 acres or 33 percent of the Project Area. The balance of the Project Area (30,539.8 acres or 48 percent) is NDOW Habitat Category 1, 2, and 3 on private lands or non-habitat (see Table 3.3-8 and Map 3.3-3). NDOW Habitat Category 1 and 2 totals 29,925.8 acres or 47 percent of the Project Area and NDOW Habitat Category 3 totals 30,088.4 acres or 47 percent of the Project Area.

Table 3.3-8
Vegetation Types in the Project Area within Sage-Grouse Habitat Categories

Mapped Vegetation	Shrub Cover Characteristics	BLM PPH (NDOW Categories 1 and 2) [1]	BLM PGH (NDOW Category 3) [1]
		(acres)	
Juniper	Not estimated	0.0 (0.0)	645.0 (810.7)
Juniper – Sagebrush	40 to 50 percent	0.0 (0.0)	1,222.4 (1,494.5)
Big Basin Sagebrush	Not estimated	124.3 (417.3)	342.6 (868.9)
Sagebrush Community	5 to 45 percent	8.8 (451.7)	21.2 (63.0)
Sagebrush-Grassland	5 to 25 percent	10,167.7 (18,386.1)	16,668.0 (23,088.2)
Snakeweed –Sagebrush	Not estimated	30.1 (61.8)	836.2 (938.3)
Sagebrush-Rabbitbrush	5 to 60 percent	1,549.9 (2,702.1)	560.0 (1,302.3)
Rabbitbrush-Grassland	30 to 35 percent	0.0 (1.6)	13.3 (27.8)
Greasewood	20 to 30 percent	50.0 (211.9)	21.1 (52.4)
Grass Dominated	5 to 15 percent	36.7 (63.1)	311.1 (324.1)
Disturbed	0 to 20 percent	2.6 (54.6)	4.0 (38.2)
Agriculture	Not estimated	154.5 (6,742.3)	37.9 (980.5)
Riparian	Not estimated	5.8 (634.2)	0.0 (27.6)
Reservoir	Not estimated	48.8 (49.1)	61.2 (63.8)
Bare ground	Not estimated	28.8 (150.0)	3.4 (8.1)
	Total	**12,208.0 (29,925.8)**	**20,747.4 (30,088.4)**

[1] BLM PPH and PGH categories apply to federal lands; NDOW categories apply to both federal and private lands.


T 31 N
T 30 N
T 29 N
T 28 N
R 54 E
R 55 E
R 56 E
R 57 E
228
Water Well - 1
Water Well - 2
Water Well - 3
Water Well - 4
Water Well - 5
Water Well - 7
Water Well - 8
McLachlan Gravel Pit
Merkley Gravel Pit
N
0
2
4
Miles
Legend
Project Area
Potential Well Pad Location
Gravel Pit Location
Potential Water Well Location
General Access
Existing - No Improvement
Existing - Needs Improvement
New - Proposed
Sage-Grouse Nesting Habitat
Sage-Grouse Wintering Habitat
3-mile Lek Buffer
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.
MAP 3.3-3
Greater Sage-Grouse Nesting Habitat
Huntington Valley
Oil and Gas Exploration Project
Elko County, NV
May 2014

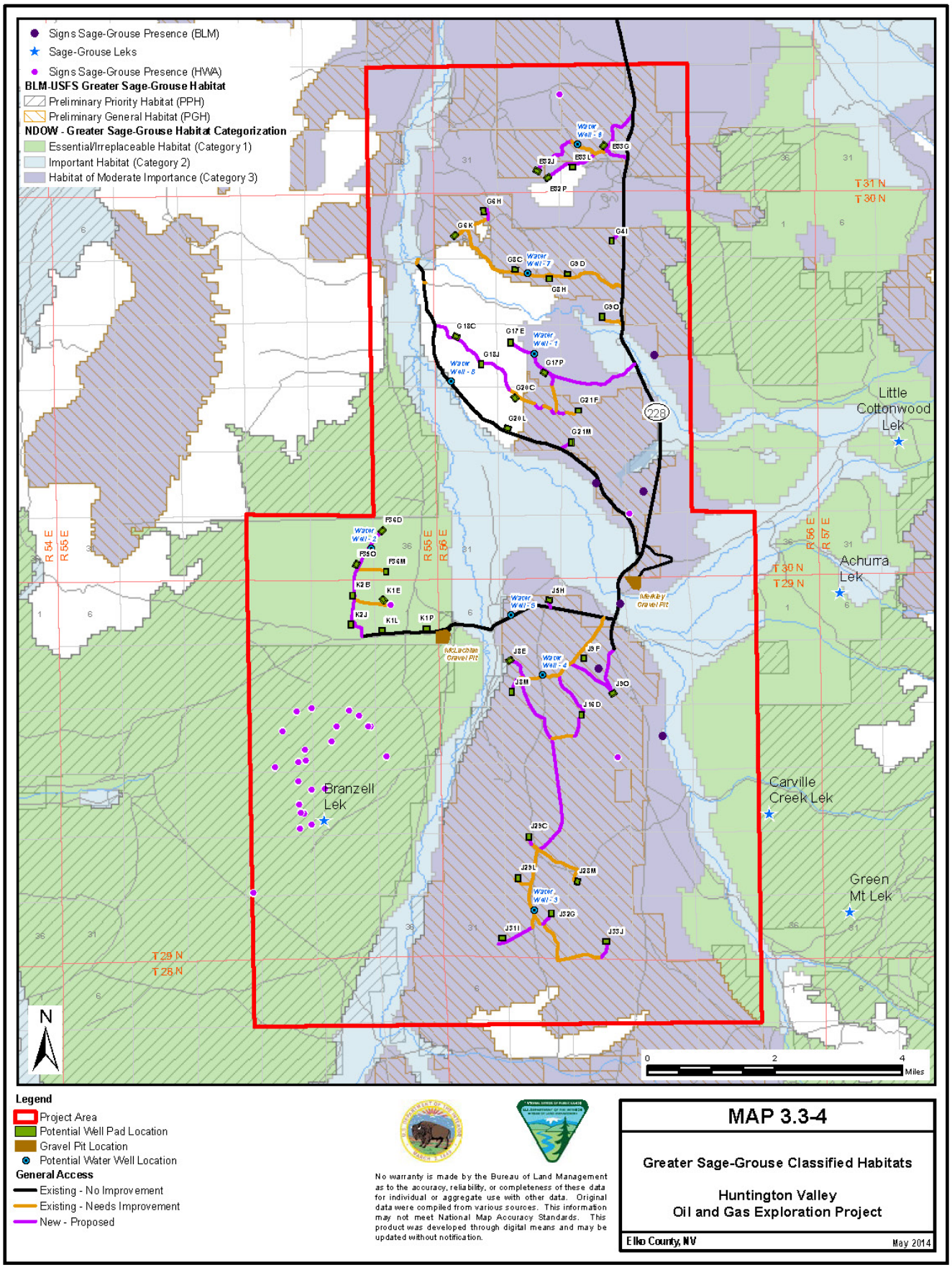
The Project Area coincides with sage-grouse nesting and early brood-rearing habitat, late-brood rearing habitat, and winter habitat (see Map 3.3-4). This map represents the most comprehensive data at the current time; however, the data is known to be incomplete and may change with future data collection. Seasonal use characteristics follow:

- In Nevada, breeding and nesting habitats are occupied from March 1 through June 30 (BLM, 2000).
- Early brood-rearing habitat is used by female grouse with chicks for up to 3 weeks following hatching. Early brood-rearing habitat descriptions can be found in Connelly et al., 2010, the Nevada Energy Development Guidelines (Nevada Governor's Sage-grouse Conservation Team -NGSCT, 2010), and the National Technical Team Report (Sage-grouse National Technical Team, 2011).
- Definition and use of late brood-rearing habitat is dependent on many factors including precipitation during spring and early summer and availability of forbs throughout the summer (NGSCT, 2010). In Nevada, brood-rearing habitats are used from April through August (BLM, 2000).
- Use of winter habitats depends on winter severity, but winter habitats are generally occupied from October through March (BLM, 2000).

Greater sage-grouse are considered a sagebrush-obligate species (Connelly et al., 2004). Based on sightings of birds, feces, and nests with egg shells, greater sage-grouse are known to occur within the Project Area (HWA, 2012c). Lek surveys were conducted by air and by foot (HWA, 2012b and 2013a) to establish baseline sage-grouse distribution in the Project Area. Additionally, the locations of sage-grouse droppings and sightings of individual birds were recorded as they were encountered while conducting pygmy rabbit surveys throughout the Project Area (see Map 3.3-4). Currently, five known greater sage-grouse leks are located in and within 3 miles of the Project Area (HWA, 2013a). They include the Achurra, Branzell, Carville Creek, Green Mountain, and Little Cottonwood leks (see Maps 3.3-4). Achurra and Little Cottonwood leks are on private land and survey access was not granted by the landowners. The Green Mountain Lek and the Branzell Lek are trend leks and are monitored by NDOW (see Table 3.3-9). In 2013, the Branzell Lek was monitored by NDOW; sage-grouse were present during each of four surveys. In 2013, Achurra, Carville Creek, Green Mountain, and Little Cottonwood leks were surveyed from aircraft; all except the Little Cottonwood lek had male sage-grouse present in 2013. The status of Little Cottonwood Lek was not reported in 2012 (HWA, 2012b) but was occupied by three males in 2011.

Twenty-seven locations of sage-grouse sign were documented during sage-grouse surveys in the Project Area, as well as two locations of females in 2012 (HWA, 2012b). In 2013, only one location with sage-grouse sign was recorded (HWA, 2013a). In January 2014, BLM reported 28 sage-grouse in the vicinity of the Branzell Lek indicating use of the area as wintering habitat (Wilkinson, 2014). For this project, leks were monitored within a 3-mile lek buffer that intersected the Project Area boundary. The 3-mile lek buffer was the standard to date for a protective buffer (Sage-grouse National Technical Team, 2011). A 4-mile buffer, while recommended by the National Technical Team, was not the standard at the time the surveys were completed.

Suitable sage-grouse nesting and brood-rearing habitat exists in portions of Project Area, usually in areas with denser sagebrush or areas with perennial grass and herbaceous cover (HWA, 2012a). Many portions of the sagebrush-grassland vegetation type in the Project Area would be considered unsuitable due to low sagebrush cover and invasion by annual grasses and less desirable shrubs. Although sage-grouse habitat quality was not evaluated during surveys, HWA noted that at least 15 percent of the Project Area is comprised of vegetation types largely viewed as low quality for sage-grouse nesting or brood-rearing (Sveum et al., 1998; Commons et al., 1999; Schroeder et al., 2004). These vegetation types include juniper, bare-ground, greasewood, and rabbitbrush.



Legend

- Project Area
- Potential Well Pad Location
- Gravel Pit Location
- Potential Water Well Location

General Access

- Existing - No Improvement
- Existing - Needs Improvement
- New - Proposed

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

MAP 3.3-4

Greater Sage-Grouse Classified Habitats

Huntington Valley
Oil and Gas Exploration Project

Elko County, NV — May 2014

Table 3.3-9
NDOW Sage-Grouse Lek Survey Data

Lek Name	1956	1957	1958	1959	1960	1961	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Green Mt. [1, 2]	21	21	20	19	35	35	0	38	45	20	26	24	38	26	34	54	200
	1980	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
	150	89	60	33	40	53	54	86	90	65	92	83	58	56	47	45	37
	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
	36	31	28	31	30	18	34	30	33	40	45	17	38	28	46	45	46
Branzell [2]		14	16	32	31	32	43	63	83	73	54	32	32	27	29	34	26
Carville Cr	7					0										24	21
Achurra						2										6	4
Little Cottonwood													8		3		0

Source: NDOW, 2014.
Blanks = no survey data available.
[1] Green Mt. is the only lek for which survey data are available for those historic years listed.
[2] Branzell and Green Mt. are trend leks.

Declines in sage-grouse populations in the Great Basin region, including Nevada, have been greatly influenced by habitat loss caused by wildfire (Connelly et al., 2004). Cheatgrass is an invasive annual grass that has led to increased wildfire frequency and subsequent loss of sagebrush communities important to sage-grouse (Baker, 2011). Fire frequency is increased with cheatgrass invasion; the establishment of cheatgrass causes substantial competition for resources used by native shrubsteppe species (Whisenant, 1990; Knick and Rotenberry, 1997). The likelihood of future fires can lead to the loss of perennial grasses and shrubs (Crawford et al., 2004) that are needed for multiple life stages for sage-grouse. The majority of the Project Area has been invaded by cheatgrass, with high densities on south-facing slopes (HWA, 2012a).

Corvids are effective nest predators of greater sage-grouse, taking eggs and possibly recently hatched chicks, and their abundance has been related to higher nest predation rates of sage-grouse (Hagen, 2009).

The Project Area is within the South Fork Population Management Unit (PMU). Nine other PMUs occur in Elko County, which supports the highest density of leks in Nevada and supports some of the largest sage-grouse populations in the state. Recently (between 1999 and 2007), wildfires have reduced sage-grouse habitat in Elko County (NDOW, 2011). Wildfires have substantially diminished sage-grouse wintering habitats over the last 10 years (NGSCT, 2010). After wildfires in 2007, male lek attendance in 2008 within the South Fork PMU decreased 30.4 percent from attendance in 2007 (NDOW, 2008). NDOW data indicates that nesting success of greater sage-grouse within the South Fork PMU has been declining since 2002 and production of juveniles has been below 2.25 chicks per hen, the minimum productivity level required to maintain a stable or increasing population (Connelly et al., 2000). According to NDOW (2012a), the sage-grouse population in Elko County has been declining from 1998 through 2012 based on peak counts at trend leks (specific leks that are intensively monitored each year).

BLM-Sensitive Species

The list of BLM-Sensitive Species for Nevada is updated every 5 years and was last updated in 2011. Species are listed as sensitive within individual BLM district offices and for the entire state. These species are included in Appendix O. Also included in the appendix are species that are also protected by Nevada State Law (NRS 501) and species that are designated as Species of Conservation Priority in the Nevada Wildlife Action Plan (NDOW, 2013b). The BLM (2011b) identified 43 animal Sensitive Species that may occur statewide and/or in the Elko BLM District and are known or potentially occur within the Project Area. Six additional species in Appendix O are Species of Conservation Priority but not BLM sensitive species. Some of the species were discussed above because they are also listed BCC or listed, proposed, and candidates for listing under the ESA.

Bats. Seventeen species of bats have been designated as BLM Sensitive Species of which 14 occur in Elko County (Bradley et al., 2006). Most of the Project Area would be characteristic of Water Source Foraging and Watering Habitat, according to criteria in the Nevada Bat Conservation Plan (Bradley et al., 2006). Some limited Bridge and Building Roosting Habitat and Tree Roosting Habitat may be present within the Project Area in abandoned buildings and cottonwood stands or juniper woodland vegetation types, respectively.

JBR (2013a) conducted surveys for bats at ten survey sites within the Project Area during August and September, 2013. The survey utilized a detector to monitor ultrasonic echolocation vocalizations of bats that provided for species identification and time duration (minutes) of calls by species which does not necessarily equate to numbers of individuals; rather the duration of calls is an index of intensity of use by a species at the site during the survey period. The ten survey site locations were grouped into four similar sampled habitats: 1) sites adjacent to stock

pond/watering troughs, 2) sites adjacent to perennial streams with riparian zones, 3) sites adjacent to intermittent drainages (based on National Hydrologic Dataset) without discernable riparian zones, and 4) sites at big sagebrush-Utah juniper interface or ecotones.

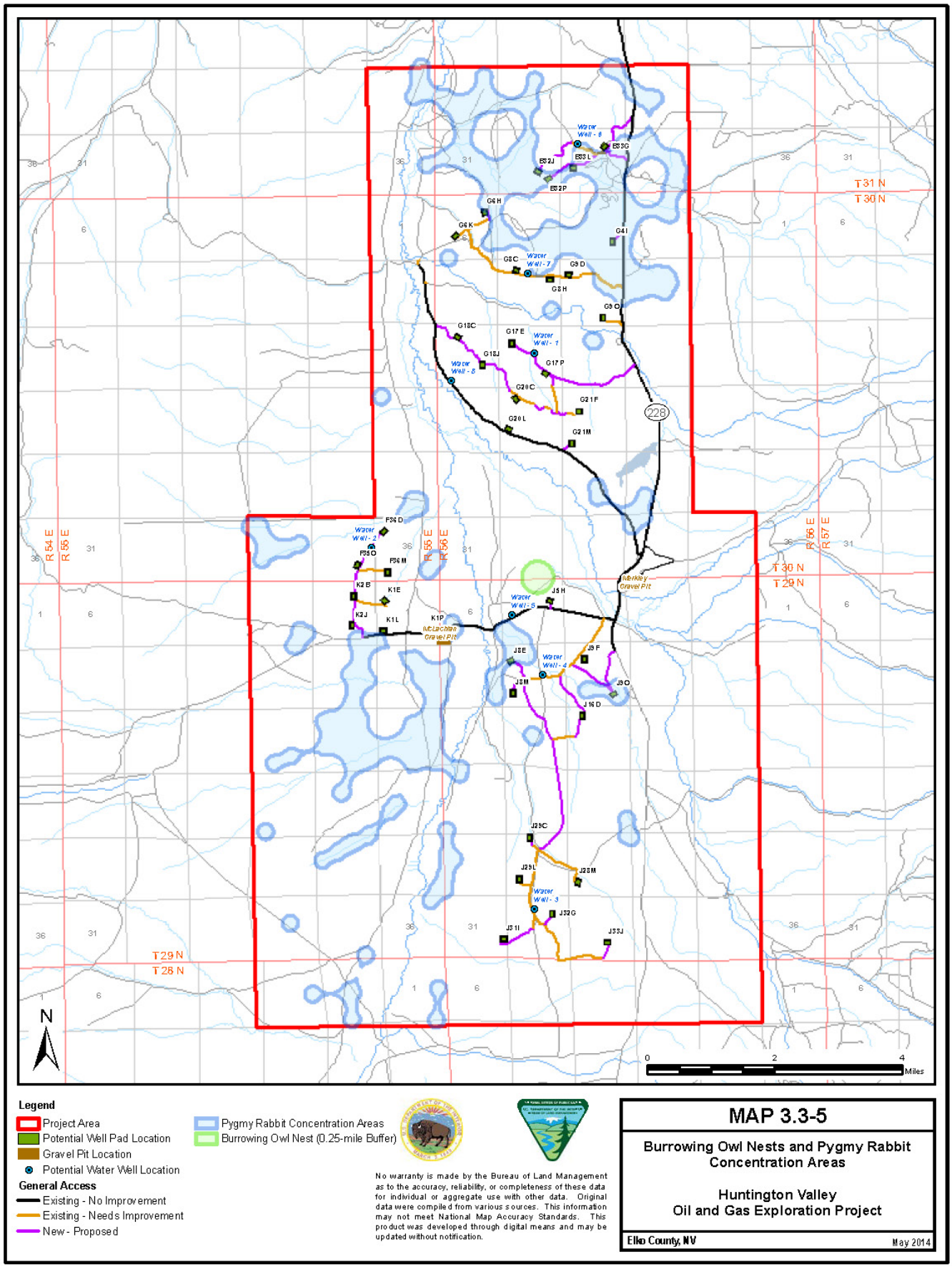
The surveys detected nine bat species within the Project Area (Table 3.3-10). All nine species were detected in the vicinity of Intermittent Drainages but the overall use, based on total durations of echolocation calls, was greatest in vicinity of Perennial Streams (sample points were adjacent to McCutcheon Creek, Cottonwood Creek, and Huntington Creek). Fewest bat species present and lowest durations of bat use were in the Sagebrush-Juniper Ecotone (Table 3.3-6). Little brown bats and long-eared myotis were detected during every survey but the greatest use of a habitat was by long-legged myotis at sites adjacent to Perennial Streams, Huntington Creek and Cottonwood Creek in particular. Townsend's big-eared bat, a Nevada state-protected species as well as BLM Sensitive species, was only detected at one site (in sagebrush/rabbitbrush vegetation near an intermittent channel for one minute on August 26, 2013).

Table 3.3-10
Average Durations of Echolocation Calls by Nine Bat Species
within the Project Area during Surveys Conducted in August and September 2013

Bat Species Recorded	Average Duration (minutes) of Calls by Bat Species per Survey Night in Habitat [1]													
	Stock Pond			Perennial Stream				Intermittent Drainage				Sagebrush-Juniper Ecotone		
Surveyed Sites [2]	Site 12	Site 2	Mean	Site 11	Site 3	Site 8	Mean	Site 4	Site 5	Site 9	Mean	Site 1	Site 10	Mean
Total Nights Surveyed	**2**	**2**	**-**	**2**	**2**	**2**	**-**	**2**	**1**	**2**	**-**	**2**	**2**	**-**
Pallid bat *Antrozous pallidus*	1	0	0.5	0	0	0	0.0	1	0	0	0.3	0	0	0.0
Townsend's big-eared bat *Corynorhinus townsendii*	0	0	0.0	0	0	0	0.0	0	1	0	0.3	0	0	0.0
Big brown bat *Eptesicus fuscus*	1	1.5	1.3	4	1.5	0.5	2.0	1.5	8	0.5	3.3	1	0	0.5
Hoary bat *Lasiurus cinereus*	1.5	0.5	1.0	0	34	0	11.3	7.5	16	1	8.2	0	0.5	0.3
Western small-footed myotis, *Myotis ciliolabrum*	1.5	14.5	8.0	2	0	14	5.3	3	1	0.5	1.5	0	0	0.0
Long-eared myotis *Myotis evotis*	4	17.5	10.8	2	0.5	6	2.8	4.5	8	1.5	4.7	1.5	7.5	4.5
Little brown myotis *Myotis lucifugus*	18.5	21.5	20.0	15	7.5	4.5	9.0	5	2	1.5	2.8	1.5	1.5	1.5
Long legged myotis *Myotis volans*	2	7.5	4.8	216.5	9	66.5	97.3	9.5	14	1	8.2	0.5	0	0.3
Brazilian free-tailed bat *Tadarida brasiliensis*	0.5	0	0.3	1.5	4.5	0.5	2.2	3.5	9	1.5	4.7	0	0	0.0
Totals	**30**	**63**	**46.7**	**241**	**57**	**92**	**129.9**	**35.5**	**59**	**7.5**	**34.0**	**4.5**	**9.5**	**7.1**

[1] Habitats inferred from digital locations of survey sites provided by JBR (2013a) superimposed on satellite imagery of the Project Area.
[2] Survey Site numbers correspond to those provided by JBR (2013a).

Pygmy Rabbits. Pygmy rabbits are present as year-round residents in the Project Area (see Map 3.3-5). The USFWS (2010c) reviewed a petition for listing pygmy rabbits under the ESA but determined that listing the species (outside of the Columbia Basin) was not warranted. The USFWS concluded that populations within the state appear to have expanded the known range of the species (USFWS, 2010c). Searches for pygmy rabbit burrows and other sign (tracks, feces) were conducted over the entire Project Area during 2012 (HWA, 2012c), and within potential disturbance areas during 2013 (HWA, 2013a).



Legend

- Project Area
- Potential Well Pad Location
- Gravel Pit Location
- Potential Water Well Location

General Access

- Existing - No Improvement
- Existing - Needs Improvement
- New - Proposed

- Pygmy Rabbit Concentration Areas
- Burrowing Owl Nest (0.25-mile Buffer)

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

MAP 3.3-5

Burrowing Owl Nests and Pygmy Rabbit Concentration Areas

Huntington Valley Oil and Gas Exploration Project

Elko County, NV — May 2014

During 2012 surveys, pygmy rabbit sign was observed at 1,960 burrows of which 1,647 were considered active due to presence of recent pellets and/or rabbits observed (HWA, 2012c). In that year, the number of active burrows ranged from 1 to 127 per section with an average density of 19.6 active pygmy rabbit burrows per square mile within the 87 sections surveyed. A total of 27 individual pygmy rabbit sightings were documented throughout the Project Area.

The scope of surveys conducted in 2013 was more limited than during the previous year: a total of 386 active burrows were found within the vicinity of proposed project disturbances. Pygmy rabbit sign was observed at 460 burrows but only 386 were classified as active (i.e., recent pellets or sightings of pygmy rabbits). A total of two individual pygmy rabbit sightings were documented during surveys in the Project Area in 2013.

Burrowing Owls. Western burrowing owls are present in the Project Area. A total of three burrowing owls were opportunistically observed (not specific surveys conducted) within the Project Area during March and April 2013. Burrowing owls were seen before the nesting season but examinations of burrows associated with owl observations could not verify whether nesting actually occurred (HWA, 2013a). Because the observations were outside the survey period for breeding, locations of observation made in 2013 would require surveys in spring 2014 to verify actual nest sites. One burrowing owl nest location was documented during 2013 surveys (see Map 3.3-5).

Other Sensitive Species. In addition to the nine bat species, pygmy rabbit, and burrowing owl, there are sensitive species known to occur within the Project Area including eight species of birds (bald eagle, golden eagle, Swainson's hawk, ferruginous hawk, greater sage-grouse, long-billed curlew, loggerhead shrike, sage thrasher, and Brewer's sparrow), and one amphibian (Columbia spotted frog). There are several other sensitive species that potentially occur, based on habitats present, species' habitat associations, and distributions (see Appendix O).

Special Status Plant Species

No BLM-sensitive plant species are known to occur within the Project Area.

3.3.4.2 Environmental Effects

3.3.4.2.1 Proposed Action Alternative

ESA Candidate Species

Columbia Spotted Frog. The Proposed Action could affect Columbia spotted frogs if runoff-generated sediment entered occupied habitats and/or hazardous materials were accidentally released into occupied streams. Columbia spotted frogs occur in Corral Creek within the southeast portion of the Project Area. The occupied habitat is on private land, adjacent to SR 228, approximately 2 miles from the nearest proposed well pad location (Well Pad J33J). Project-related traffic is not expected to utilize SR 228 in the vicinity of the occupied habitat and risks of sedimentation, spills, or release of hazardous substances into Corral Creek are unlikely. Project-related traffic would cross Corral Creek on SR 228 approximately 5.8 miles downstream from the occupied habitat. Available information does not indicate that Columbia spotted frogs occur in lower reaches of Corral Creek or any other perennial streams within the Project Area but known surveys within the Isolated Streams, Ruby Mountains Conservation Unit were conducted most recently in 1998 (Columbia Spotted Frog Technical Team, 2003) and information on the species distribution is not current. Occurrence of Columbia spotted frogs elsewhere in the Project Area is unknown.

Greater Sage-Grouse. The Sage-grouse National Technical Team (NTT) created a report on sage-grouse conservation measures that included science based recommendations for managing uses on BLM-administered lands. The NTT report identified three primary potential risks to sage-grouse from energy and mineral development as follows:

- Direct disturbance, displacement, or mortality of grouse:
- Direct loss of habitat, or loss of effective habitat through fragmentation and reduced habitat patch size and quality; and
- Cumulative landscape-level impact.

Oil exploration including pad construction, well drilling, well completion, oil production, and related activities would create noise and visual intrusion, and fragment habitat. New roads increase human access, increase human activity, fragment habitat, and increase the spread of invasive non-native species and noxious weeds. Oil exploration could potentially disturb sage-grouse during critical times such as lekking, nesting, brood rearing, and winter seasons. Specifically, energy development may impact sage-grouse in the following or more ways:

- Permanent loss of habitat due to vegetation removal and fragmentation;
- Displacement from occupied habitats (breeding, brood rearing, wintering) by human presence, traffic on nearby roads, and noise;
- Lek and nest abandonment due to disturbance by raptors and corvids perching on nearby structures; and
- Degradation of affected vegetation by invasive non-native species and noxious weeds.

Noble has submitted Greater Sage-Grouse BMPs (Appendix I) to reduce potential impacts to greater sage-grouse.

Loss of Habitat. The Proposed Action would directly affect sage-grouse through removal of habitats within NDOW Category 1, 2, and 3 habitats (Table 3.3-11) with corresponding removal of PPH and PGH (Table 3.3-11). The amount of vegetation affected by surface disturbance from well pad, gravel pits, and road construction is provided below in Section 3.3.2, Vegetation. The Proposed Action includes potential surface disturbance (based on 39 well pads although only 20 would be constructed) of 20.9 acres of PPH, and 231.5 acres of PGH (Table 3.3-11). The placement of well pads, gravel pits, and roads mostly avoids effects to PPH on federal land.

An estimated 90.1 acres of potential surface disturbance (based on 39 well pads although only 20 would be constructed) is identified in NDOW Category 1 and 2 habitats; and 280.2 acres of surface disturbance is identified in NDOW Category 3 habitats (Table 3.3-11). Most big sagebrush cover, where it exists, would be affected by construction within sagebrush-grassland vegetation where it is present in the four NDOW habitat categories. Effects to NDOW sage-grouse habitats would occur on BLM-administered and private land.

Table 3.3-11
Maximum Surface Disturbances in Vegetation
Types within BLM and NDOW Sage-Grouse Habitat Categories

Mapped Vegetation[1]	Shrub Cover Characteristics[2]	BLM PPH (NDOW Categories 1 and 2) [1]	BLM PGH (NDOW Category 3) [1]
		(acres)	
Woodland			
Juniper	Not estimated	0.0 (0.0)	2.3 (2.4)
Juniper – Sagebrush	40 to 50 percent	0.0 (0.0)	16.3 (16.3)
Shrubland			
Big Basin Sagebrush	Not estimated	0.0 (0.0)	0.5 (0.5)
Sagebrush-Grassland	5 to 20 percent	19.9 (83.9)	198.1 (247.1)
Snakeweed –Sagebrush	Not estimated	0.6 (0.6)	12.1 (12.4)
Sagebrush-Rabbitbrush	5 to 55 percent	0.3 (3.7)	1.9 (2.1)
Nonnative-Dominated Herbaceous Vegetation			
Grass Dominated	5 to 15 percent	0.0 (1.5)	1.7 (1.7)
Agriculture	Not estimated	0.1 (0.4)	0.0 (0.0)
TOTAL		**20.9 (90.1)**	**232.9 (282.5)**

[1] BLM PPH and PGH categories apply to federal lands; NDOW categories apply to both federal and private lands.

Threshold densities of human disturbances have been established for priority habitats that, if exceeded, would reduce habitat function for greater sage-grouse. Surface disturbances exceeding 3 percent of priority habitats is a density threshold to be avoided or requiring mitigation if exceeded (Sage-grouse National Technical Team, 2011). Table 3.3-12 shows percent disturbance (existing and proposed) in suitable habitat both in the PMU for the whole Project and by individual lek (within the 3-mile buffer). The 3 percent threshold is not exceeded in any of the analysis areas shown in Table 3.3-12, either by the PMU or by individual leks.

Wellfield development exceeding one pad per square mile (640 acres) impacts breeding populations, and densities of eight pads per square mile exceed sage-grouse tolerance (Naugle et al., 2011). As proposed, well pad density would exceed these thresholds at some locations. The first two proposed well pads (K2J and K1L) would be concentrated within one square mile. Requiring subsequent well pads to be located a minimum of 1 mile from the initial concentration of well pads would minimize effects to greater sage-grouse. Once data are gathered through monitoring efforts, including noise and collaring, the data would be used to determine future development practices.

Table 3.3-12
Existing and Proposed Disturbance Related to Greater Sage-Grouse Suitable Habitat

Analysis Area	Suitable Habitat (acres)[1]	Existing Disturbance (acres)[2]	Proposed Project Disturbance (acres)	Total Disturbance (acres)	Percent
South Fork PMU[3]	590,678.3	12,314.2	428.1[4]	12,742.3	2.16
Achurra Lek	14,621.1[6]	125.4	3.3	128.7	0.88
Branzell Lek	18,101.1[6]	187.6	0.3	187.89	1.04
Carville Creek Lek	17,320.8[6]	178.3	0.0	178.3	1.03
Green Mountain Lek	16,410.6[6]	183.6	0.0	183.6	1.12
Little Cottonwood Lek	14,719.0[6]	123.1	0.0	123.1	0.84

[1] Suitable Habitat includes NDOW Category 1, 2, and 3 habitats. Cities, towns, and highways have been removed from suitable habitat.
[2] Existing disturbance includes two-track roads, ranches, gravel pits, and seismic disturbance.
[3] South Fork PMU – includes only the portion of the PMU south of Lamoille Highway.
[4] Estimated for identified disturbance associated with 39 well pads. Actual disturbance would be 314.1 acres.
[5] Percent for actual acres (314.1) is 2.04.
[6] Suitable habitat within a 3-mile lek buffer. The 3-mile lek buffer was the standard to date for a protective buffer (Sage-grouse National Technical Team, 2011).

Perimeter or reclamation fences constructed to exclude people, livestock, and wildlife from fluid mineral production and reclamation activities may present a collision hazard to these species, particularly if located near leks or other high-risk areas (BLM, 2013b). Placing highly visible markers on the fence wires would reduce sage-grouse collisions with fences.

Noise and Human Presence During Breeding Season. In addition to direct effects, noise and human presence could decrease habitat functions of nesting, breeding, brood-rearing, and wintering habitats during well pad, gravel pit, road construction, drilling, and completions. During the Production/Operations Phase, pump units, generators, heaters, and flares on well pads would generate noise when operative, and would decrease habitat effectiveness in undisturbed habitats surrounding each producing well pad.

Simulated noise from natural gas well pads and traffic on roads has been shown to negatively affect male attendance at leks (Blickley et al., 2012). Female sage-grouse moved farther from leks to nest and avoided nest initiation in areas disturbed by vehicles (1 to 12 vehicles per day), probably combinations of the traffic activity and associated noise (Lyon and Anderson, 2003). No studies of noise effects on sage-grouse during winter have been found but wintering sage-grouse avoided coal bed natural gas developments, potentially within distances of 1,000 meters (3,280 feet) (Naugle et al., 2006). Given overall avoidance of wildlife from anthropogenic noise (Federal Highway Administration - FHA, 2004), sage-grouse would be expected to avoid sites with project-related noise during all life phases.

All proposed well pads and the gravel pits are outside of the 3-mile lek buffer zone of known leks. Access roads are also outside of the 3-mile lek buffer with two exceptions; the proposed access road to Merkley Pit 1 and the proposed access road to Well Pad K2J. The proposed access to the Merkley Pit 1 would require travel on Smith Creek Rd. for 1,506 feet (upgrading required) and upgrading of 2,213 feet of two-track road resulting in 3.3 acres within the 3-mile buffer of the Achurra Lek. The access to the K2J well pad would require travel on Circle L Ranch Rd. for 864 feet (no upgrading) and construction of a new resource road for 341 feet resulting in 0.29 acres of disturbance within the 3-mile lek buffer of the Branzell Lek. Restricting traffic on these roads during lek attendance (March 1 to May 15) to portions of the day between 10:00 a.m. and 5:00 p.m. would minimize impacts from traffic. Adhering to a 20 mph speed limit

on BLM system roads would also reduce impacts to sage-grouse in the Project Area. Noble would be required to obtain a waiver from the BLM for construction within the 3-mile lek buffer.

Ambient noise in the Project Area was not measured at sage-grouse leks during pre-dawn hours when leks are active but was measured along the CNHT Hastings Cutoff in the Project Area during September 2013 (HWA, 2013b). Ambient noise levels along the trail ranged from 18 dBA to 24 dBA, depending on wind conditions. In another study, baseline noise measurements taken between 12 am and 9 am in spring 2013 at three greater sage-grouse leks west of Wells ranged from 18 to 25.5 dBA when winds were calm (HWA, 2013b).

BMPs for Fluid Mineral Developments proposed by the Sage-grouse National Technical Team (2011) include limiting noise to less than 10 dBA above ambient measures (18-26 dBA) at sunrise at the perimeter of a lek during active lek season (Blickley et al., 2012). The 10dBA above ambient levels is also the standard agreed upon by the BLM and NDOW. It has been used for other projects and shown to be effective (such as the Ormat Geothermal Plant).

Noise levels produced during the Construction/Drilling Phase by a drilling rig that would be used in the Huntington Valley Project Area were measured by Brennan (2013a). The measured noise was used to model noise from the same drilling rig on each of the proposed well pad locations to a distance where the noise would attenuate to 25 dBA at leks (Brennan, 2013b). Modeled noise produced by a drilling rig mostly attenuates to 25 dBA at 6,500 feet from the exploration/production well pad locations but with snow and ice, noise attenuates to 25 dBA out to 9,700 feet in some cases (Brennan, 2013b). Based on modeling, no drilling rig noise would be audible at leks, assuming noise 4 dBA above ambient levels would be detected by sage-grouse as by other birds (Dooling and Hulse, 1989). Some machinery potentially used to construct new or upgrade existing roads and well pads might be audible at some leks under hard site conditions (snow) if operated during times when sage-grouse were present. However, this is unlikely because construction would not usually be occurring when there is snow cover. Under soft site conditions, construction machinery would not be audible at leks.

Two rigs would not be side by side on the same well pad, but could be operating simultaneously on adjacent well pads. Whether noise from the two rigs at a lek would be additive or not would depend on their orientation to the lek and distance apart. Sound levels from multiple noise sources would be combined by the following set of rules specified by the FHA (1995).

- When two noises differ by 0 or 1 dBA, add 3 dBA to the louder noise;
- When two noises differ by 2 or 3 dBA, add 2 dBA to the louder noise;
- When two noises differ by 4 to 9 dBA, add 1 dBA to the louder noise; and
- When two noises differ by ≥10 dBA, the louder noise is dominant.

The FHA rules would only apply if two rigs were side by side on the same well pad which is not the case. For separated rigs, the attenuation of noise as a function of distance would have to be evaluated from each rig to the lek before adding decibels and it would be unlikely that drilling noise would require adjustment. Because the maximum noise that might be added would be 3 dBA, the noise modeled by Brennan & Associates plus 3 dBA would still be below 25 dBA at leks but audible noise would extend farther into 3-mile buffers.

Noise greater than 10 dBA above ambient would occur in breeding habitats, brood-rearing habitats, and/or wintering habitats of proposed well pads during drilling. Noise within the 3-mile lek buffer may influence attendance of hens at the leks and mitigation would be required to decrease noise levels. In Nevada, leks are attended from March through May, brood-rearing habitats are utilized from April through August, and winter habitats are used from October through March (BLM, 2000).

Restricting drilling and completion during the lekking season where noise levels are determined to be 10 dBA or greater above ambient levels within the 3–mile lek buffer would reduce effects to sage-grouse. Noise would be limited to less than 10 dBA above pre-project ambient noise levels at sunrise and during morning hours of 4:00 a.m. to 10:00 a.m. during the active lek season (March 1 to May 15). Timing restrictions related to noise within the 3-mile lek buffer would also apply to completion activities. Constructing and upgrading the access roads within the 3-mile buffer zone of the Branzell Lek (K2J well pad) and the Achurra Lek (Merkley Pit 1) outside of the lekking and nesting season would further reduce impacts to greater sage-grouse.

Noise levels of generators used during hydraulic fracturing are not available but are thought to be the loudest noise during the Construction/Drilling Phase. Conducting noise monitoring during hydraulic fracturing on well pads that have a noise influence within the 3-mile no disturbance zone of leks would allow determination if the noise generated at the well pad would be 10 dBA or greater above ambient levels within the 3-mile buffer. Measures such as erecting baffling around equipment or sinking the power sources of hydraulic fracturing equipment below the ground would reduce potential effects to greater sage-grouse.

Long-term noise on each producing well pad during the Production/Operations Phase would be from pumping units, generators, line heater, and flares although no noise rating has been provided for any of these well pad components that would be used for the Proposed Action. Noise from pump units and other components would be a long-term effect, reducing habitat effectiveness of otherwise undisturbed habitat within some distance of each well pad.

Effects from Raptors and Corvids. Raptors and corvids (jays, magpies, crows, ravens) are effective nest predators of greater sage-grouse, taking eggs and possibly recently hatched chicks, and their abundance has been related to higher nest predation rates of sage-grouse (Hagen, 2009). Population trends show that common ravens have been increasing on BBS routes within 100 miles of the Project Area during the past 10 to 15 years. Common ravens have been documented roosting and nesting on a variety of industrial infrastructures, including tanks and other elevated structures where available (Merrell, 2012). Ravens already nest in the vicinity of the Project Area (see Section 3.3.3, Migratory Birds) and, if undeterred, would be expected to perch, roost, and/or nest on the oil and water storage tanks proposed for well pads. Raptors in the area would also be expected to utilize the elevated structures as hunting perches. Sage-grouse tend to use nesting habitats and utilize brood-rearing habitats where there are lower densities of ravens and other avian predators such as raptors (Dinkins et al., 2012). Predation of nests, sage-grouse chicks, and adults would adversely affect already low recruitment in the South Fork PMU. Placement of perching and nesting deterrents on aboveground structures would reduce the potential for predation on greater sage-grouse.

Degradation of Vegetation by Weeds and Dust. Impacts to sagebrush vegetation could also result from fugitive dust created by construction vehicles and pickup trucks, as well as from invasive non-native species and noxious weeds establishing in disturbed areas. Fugitive dust effects on vegetation are discussed in Section 3.3.2, and invasive non-native species and noxious weed effects and are discussed in Section 3.3.1.

BLM-Sensitive Species

Effects to BLM-sensitive animal species would generally be similar to effects addressed in Section 3.3.3, Migratory Birds, in Section 3.3.5, Wildlife and Fisheries, and to other sensitive species discussed in this section.

Bats. Bat species forage in the Project Area and vicinity, although suitable roosting habitats for the species would not be affected. The Proposed Action could impact bats by adversely affecting foraging habitats, contaminating surface water, generating noise that could interfere with echolocation, and through night lighting that may alter their behavior. Construction and

operation of all project components would generate noise levels that exceed ambient levels various distances from roads and pads. Noise from traffic and other sources is believed to interfere with bats' echolocation of insect prey (Jones, 2008). Loss or reduction of foraging habitat can adversely affect bats (Adams, 2003).

Although sample size was limited, bat survey results in Table 3.3-10 indicate that most bat foraging occurs near perennial streams and riparian areas, followed by foraging in the vicinity of stock ponds and stock tanks. That finding is consistent with reports for insectivorous bat species use of Water Source Foraging and Watering Habitat, defined by the Nevada Bat Working Group (Bradley et al., 2006). Less foraging intensity was evident near intermittent drainages and at upland sagebrush-juniper sites (Table 3.3-10). Well pads and roads have been generally placed farther than 400 feet from open water, perennial streams, and associated riparian wetlands (see discussion in Section 3.2.4.3, Wetlands/Riparian/Floodplains.

Drilling is anticipated to occur on a 24-hour basis, thereby requiring the use of lights during night-time hours. This may attract insects to the drill pads, and subsequently attract foraging bat species (JBR, 2013b). Lighting would be controlled to minimize the potential for bat collisions (i.e., angled down). Mortality can also occur if bats use exhaust stacks on production facilities to perch, roost, or nest and become trapped, poisoned by carbon monoxide, or incinerated (BLM, 2013b).

Noble has voluntarily prepared a BBCS designed to reduce the potential risks of bird and bat mortality that may result from implementing the Proposed Action. The measures included in the BBCS and the above discussion of effects are listed in Section 2.2.1.6, Project Design Features. With implementation of the measures in the BBCS, effects to bats is expected to be minimal.

Pygmy Rabbits. Effects to pygmy rabbits are expected to be similar to effects to greater sage-grouse and other wildlife. Pygmy rabbits are a sagebrush-obligate species and may be sensitive to direct loss or modification of sagebrush habitat by any number of causes, including energy exploration and development (USFWS, 2010c). Well pad locations have been placed away from occupied pygmy rabbit burrows (see Map 3.3-5) to the extent possible. Ground vibrations and direct impact to burrows by heavy construction equipment are expected to cause collapse, similar to vibroseis truck impacts (Wilson, 2011). Pygmy rabbit colonies shift over time so colonies would be resurveyed prior to construction. If construction disturbances cannot avoid burrows by 100 feet in more densely populated pygmy rabbit areas, the BLM may also require a biological monitor to precede ground clearing machinery to ensure that an adequate buffer is maintained. Brush hogging or mowing areas within 100 feet of pygmy rabbit burrows within 72 hours of ground disturbance would encourage pygmy rabbits to leave the area.

Burrowing Owls. Burrowing owls are protected by Nevada State Law and the MBTA. The BLM Elko District defined seasonal buffers for burrowing owls from March 1 to August 31, extending 0.25 mile from the nest burrow. One burrowing owl nest buffer within the Project Area is shown on Map 3.3-5. The well pad locations have been placed away from the occupied nest burrow and its buffer zone. Surveys for new burrowing owl nest sites would be conducted prior to construction of roads and well pads if initiated during the nesting period. If new occupied burrowing owl nests are found, surface disturbing activities would be delayed until after August 31 within 0.25 mile of nests. By following these measures, direct and indirect effects to burrowing owls would be reduced to a negligible level.

Other Sensitive Species. As discussed in Section 3.3.3 Migratory Birds, the migratory birds, including BLM-sensitive species that possibly nest in the Project Area are likely to complete nesting by early to mid-August (Great Basin Bird Observatory, no date) and surface disturbing activities initiated after July 31 (core nesting period) would minimize effects to the species. Nesting surveys would be conducted every year that new project components (road, well pads)

are implemented. Raptor spatial and temporal buffers (see Table 3.3-7 Migratory Birds) would be implemented around all identified nest sites occupied by at least one adult.

Mitigation and Monitoring Measures

In addition to the BBCS and Project Design Features including Noble's Greater Sage-Grouse BMPs (Appendix I), the BLM has identified the following mitigation measures to further reduce potential impacts to Special Status Animal Species:

- In more densely populated pygmy rabbit areas, the BLM shall require a biological monitor to precede construction to ensure that an adequate buffer is maintained.
- Raptor perching and nesting deterrents shall be placed on all aboveground structures to reduce potential predation on BLM-sensitive species including greater sage-grouse, burrowing owls, and pygmy rabbits.
- Where proposed disturbance is within 100 feet of pygmy rabbit burrows, the area shall be brush-hogged or mowed within 72 hours of ground disturbance to encourage pygmy rabbits to leave the area.
- Highly visible markers shall be placed on fence wires to reduce sage-grouse collisions with fences.
- To consolidate disturbance, pad density shall be maintained into the smallest area practical to maintain viable and safe operations. Pads shall be located to one concentration area per square mile. The initial two well pads were placed to meet the consolidation criteria; if/or when additional well pads are submitted for construction, they shall be located at a minimum 1 mile from the two initial well pads. The new well pads shall be consolidated into as small an area as possible and outside the square mile of influence of any other concentration area. This format shall be followed throughout the continued development of the project.
- Noble shall be responsible for monitoring lek attendance on active leks (Branzell, Carville Creek and possibly Green Mountain, Achurra and Little Cottonwood) where the 3 mile no-disturbance buffer zone intersects with the Project Area boundary throughout the life of the exploration project. Noble contractors shall adhere to NDOW lek monitoring protocols and annual monitoring reports will be utilized to determine the presence or absence of project impacts to said lek sites. Reduction in lek attendance as determined by monitoring will be addressed by a wildlife working group. NDOW will determine whether Noble will monitor trend leks.
- Noble shall complete interim reclamation at well pad sites that have been deemed unacceptable for the limited development associated with the exploration phase. Noble has agreed to reclaim all well pads to 3.5 acres after drilling and hydraulic fracturing on well pads to be produced. No pad shall be left unreclaimed to any extent after these initial steps. Area to be reclaimed shall be appropriately recontoured and seeded with a BLM-approved sage-grouse habitat seeding. The reclaimed areas shall be fenced until habitat criteria have been met. Noble shall be responsible for maintaining these fences.
- BLM, NDOW, and Noble will conduct a habitat evaluation that will take place before each well pad construction to determine which conditions of approval (incorporated into the EA sections) are appropriate for resource protection. This evaluation will determine habitat values to sage-grouse and other species and the appropriateness of well pad location in regard to data collected from other monitoring efforts recommended. Noble shall submit well pad location selection as early as possible to allow the evaluation to take place in construction timeframes.
- Noble shall conduct noise monitoring at lek sites and within the 3 mile buffer if/or when hydraulic fracturing occurs on well pads that have a noise influence within the 3 mile no disturbance zone of said lek sites. Monitoring shall be set up at the lek and at intervals within the nesting and/or brood rearing habitat at the onset of hydraulic fracturing

(generator use) to determine attenuation and if there are 10dBa or greater increases above ambient noise levels within the 3 mile buffer. A noise monitor will be placed at lekking sites and within brood rearing habitats. If noise generated at the well pad shows 10 dBa above ambient levels or greater within the 3 mile buffer (using L50 to determine the 10dBa threshold), steps shall be taken to reduce noise at the well pad location. Such steps shall include erecting baffling around equipment or sinking the power sources of hydraulic fracturing equipment below ground level to decrease noise impacts to the surrounding areas. Any additional responses to impacts will be addressed by a wildlife working group. Noise monitoring can be discontinued after initial data collection as long as there will be no operational changes at future well pad sites and if working group members are satisfied with noise data results.

- No drilling shall occur during lekking season if well pad noise levels are determined to be 10 dBa or greater above ambient within the 3 mile no disturbance buffer. Though the initial Noble noise report indicated that there is attenuation of drill activities before reaching the lek, impact dBa's of greater than 10 dBa above ambient were recorded within nesting and/brood rearing habitat that may influence hens attendance at the leks. Noble shall phase drilling to avoid potential noise disturbance within the 3 mile buffer of leks. Drilling that does not intersect the 3 mile buffer zone can occur within the lekking dates. Other mitigation measures (described in this section) have been developed to determine hens' behavior in these areas.
- No well pad construction shall take place during lekking season, if construction equipment will have noise impacts determined to be 10 dBa or greater above ambient within the 3 mile buffer of a lek site. Noble shall phase pad construction to avoid potential noise disturbances within the leks 3 mile influence. Well pad construction noise that does not intersect the 3 mile buffer zone can occur within lekking season dates.
- Noble shall hire a contractor to monitor hen movements throughout the life of the exploration project through a collaring effort in cooperation with BLM and NDOW. The exploration project allows the opportunity to determine the responses of hens to increased anthropomorphic features, increased human presence and habitat fragmentation. Hens will be the focus of this measure as males have numerous measures, BMP's and applicant committed measures already in place throughout the EA. Collaring would be used in nesting and brood rearing habitat adjacent to constructed well pads and the initial collaring shall occur concurrent to the construction of the two initial well pads and take place in the vicinity of the Branzell lek. As the project progresses, potentially additional hens in additional areas shall be collared and added to the data set. Satellite collars would be most efficient and limit disturbance to the birds. Noble shall interact closely with NDOW in efforts to collar on trend leks. Annual reports (submitted by September 15) on hen movement while the project is on-going will allow regulators a chance to determine if existing measures are working and provide an expedient time frame to adjust measures to reduce unforeseen reactions. An MOU will be developed between Noble, BLM, and NDOW, in which the details will be decided.
- A wildlife working group will be established to apply adaptive management techniques for the project by evaluating monitoring data, adjusting protocols, and responding to impacts that have been documented due to the implementation of monitoring efforts. The group will consist of BLM, NDOW and Noble representatives. These group discussions will insure how best to address impact issues, deal with modifications Noble deems necessary as their exploration progresses and deal with any future unexpected outside influences that may have an effect on sage-grouse or Noble's ability to protect sage-grouse resources. The BLM Tuscarora Field Office, as the authorizing office, will retain final regulatory decision authority in the event that group members cannot come to a consensus.

3.3.4.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts associated with the Well Pad K2J Access Alternative would be similar to those described above for the Proposed Action Alternative; however under this alternative, there would be no disturbance with the 3-mile lek buffer of the Branzell Lek. There would be an additional disturbance of 0.28 acre of surface disturbance under this alternative.

3.3.4.2.3 No Action Alternative

Under the No Action Alternative, there would be no change from either the Proposed Action Alternative or the Well Pad K2J Access Alternative to current conditions for Special Status Animal Species within the Project Area.

3.3.4.3 Cumulative Effects

The CESA for sensitive and special status species, excluding sage-grouse, encompasses 833,399 acres (see Table 3.1-2 and Map 3.1-5). No direct or indirect impacts would occur to sensitive and special status species outside of this CESA boundary. Between 1999 and 2013, 158,724 acres (or 19 percent) within the CESA have been impacted by fire, and various vegetation treatments have been applied to 92,201 acres (or 11 percent) (see Table 3.2-16). The surface disturbance associated with the past and present actions and RFFAs (e.g., rights-of-way, pipelines, oil and gas activities, mines) is estimated to be 14,537 acres, and when combined with the 314 acres of surface disturbance proposed for the Project, the total is 14,851 acres or 2 percent of the CESA (see Table 3.2-16). The unincorporated community of Jiggs and Spring Creek, which is a census-designated place, are also located within the CESA as well as portions of SR 227 and 228.

The CESA for sage-grouse encompasses 966,019 acres (see Table 3.3-13 and Map 3.1-6). No direct or indirect impacts would occur to sage-grouse outside of this CESA boundary. As shown in Table 3.3-13, within the CESA, 185,709 acres are designated as PPH and 191,293 acres as PGH. Between 1999 and 2013, fire impacted 283,587 acres within the CESA, of which 67,732 acres were PPH and 32,066 acres were PGH. Also between 1999 and 2013, vegetation treatments were applied to 145,361 acres, of which 48,045 acres were PPH and 8,627 acres were PGH. Table 3.3-13 also provides the acres by the designated NDOW categories. The surface disturbance associated with the past and present actions and RFFAs (e.g., rights-of-way, pipelines, oil and gas activities, mines) is estimated to be 14,618 acres, and when combined with the 314 acres of surface disturbance proposed for the Project, the total is 14,932 acres or 2 percent of the CESA (see Table 3.3-13). The unincorporated community of Jiggs and a portion of Spring Creek, which is a census-designated place, are also located within the CESA as well as portions of Interstate-80 and SR 227 and 228.

Special Status Species are generally protected and/or avoided for any activities on public lands but may not be protected for actions on private lands unless they are actually federally-listed or state-protected. These species and several others (such as sagebrush-obligates) have been subjected to a long period of incremental habitat loss and conversion of native vegetation to vegetation dominated by invasive species. This loss and conversion of habitat has occurred throughout the CESAs (see Maps 3.1-5 and 3.1-6) and has reduced the value of habitats to sagebrush associated wildlife species. Section 3.3.5.3 provides more detail regarding potential cumulative effects to wildlife species.

Nearly all sensitive species would be affected by the past, present, and reasonably foreseeable future actions (i.e., wildland fire, livestock grazing, noxious weed proliferation, oil and gas exploration, dispersed recreation, OHV use, etc.) (see Tables 3.2-16 and 3.3-13) unless effects are avoided or mitigated. Cumulative effects to Special Status Species would be limited to vegetation/habitat and would be small (2 percent of the total acres) within the CESAs.

Table 3.3-13
Acres Affected within Sage-Grouse South Fork
Population Management Unit Cumulative Effects Study Area

Acres within CESA	Acres Disturbed by Fire [1] (% of CESA or Habitat)	Acres of Vegetation Treatments [2] (% of CESA or Habitat)	Acres of Disturbance within Cumulative Effects Study Area by Past, Present, and RFFA's [3]				Acres of Total Project Effects	Total Cumulative Disturbance Acres (% of CESA)
			Case Type	Authorized & Pending	Closed	Total		
Total Acres: 966,019 BLM Habitat PPH[5]: 185,709 (19%) PGH[6]: 191,293 (20%) NDOW[7] Habitat Cat. 1&2: 223,535 (23%) Cat. 3: 231,342 (22%)	Total: 283,587 (29%) BLM Habitat PPH: 67,732 (37%) PGH: 32,066 (17%) NDOW Habitat Cat. 1&2: 85,244 (38%) Cat. 3: 48,184 (21%)	Total: 145,361 (15%) BLM Habitat PPH: 48,045 (26%) PGH: 8,627 (5%) NDOW Habitat Cat. 1&2: 56,250 (25%) Cat. 3: 9,701 (4%)	Rights-of-Way: Pipelines, Power lines, Fiber Optic Cable, Telephone Lines, Roads, Fences, Railroad	2,862	249	**3,111**	Total: 314 [4] (0.3%) BLM Habitat PPH: 21 (0.01%) PGH: 232 (0.1%) NDOW Habitat Cat. 1 & 2: 90 (0.04%) Cat. 3: 280 (0.1%)	14,932 [8] (2%)
			Oil & Gas; Mines; Mineral Material Sites: Sand, Gravel, topsoil sources and pits	11,167	340	**11,507**		

[1] Source: BLM GIS Data. Historic Fires (1999-2013).
[2] Source: BLM GIS Data. Vegetation Treatments (1999-2013).
[3] Reasonably Foreseeable Future Actions (RFFA). Source: BLM GIS Data. Land Lines/Land Points and Mineral Material Sites data (2013). Acres are approximate and are conservative, using the total area of the project boundaries to calculate the surface disturbance rather than the areas within the boundaries actually disturbed by the specific projects.
[4] Disturbance based on 20 well pads.
[5] PPH = Preliminary Priority Habitat
[6] PGH = Preliminary General Habitat
[7] NDOW = Nevada Department of Wildlife
[8] Total is the sum of 3,111 and 11,507 and 314. Percentage is derived by dividing by total CESA acreage (966,019).

3.3.5 WILDLIFE AND FISHERIES

3.3.5.1 Affected Environment

Big Game

The majority of the Project Area is located within NDOW Hunt Unit 065 which is west of SR 228. Hunt Unit 102 is to the north of Harrison Pass Road and Hunt Unit 103 south of the road, overlapping the southeast corner of the Project Area.

Pronghorn. The entire Project Area coincides with seasonal ranges used by pronghorn. Two population groups utilize the Project Area. A portion of one population is within Hunt Unit 65 and portions of the other population are within Hunt Units 102 and 103. Approximately 40,088 acres of the Project Area is crucial winter range and 9,677 acres is summer range used by a portion of the population within Hunt Unit 065 (see Map 3.3-6).

NDOW (2013c) describes crucial winter range a subset of winter range that is vital to the continued existence of the population but cautions that those sites typically have poor forage but have low snow depths. Summer range support a majority of animals beginning in late spring for the primary purpose of parturition before moving to other seasonal ranges, usually in late autumn (NDOW, 2013c). The pronghorn population in Hunt Units 102 and 103 utilizes year-round habitat (13,730 acres) east of SR 228 (NDOW, 2007). Year-round ranges are inhabited during all months of the year; year-round range is exclusive of all other seasonal ranges (NDOW, 2013c).

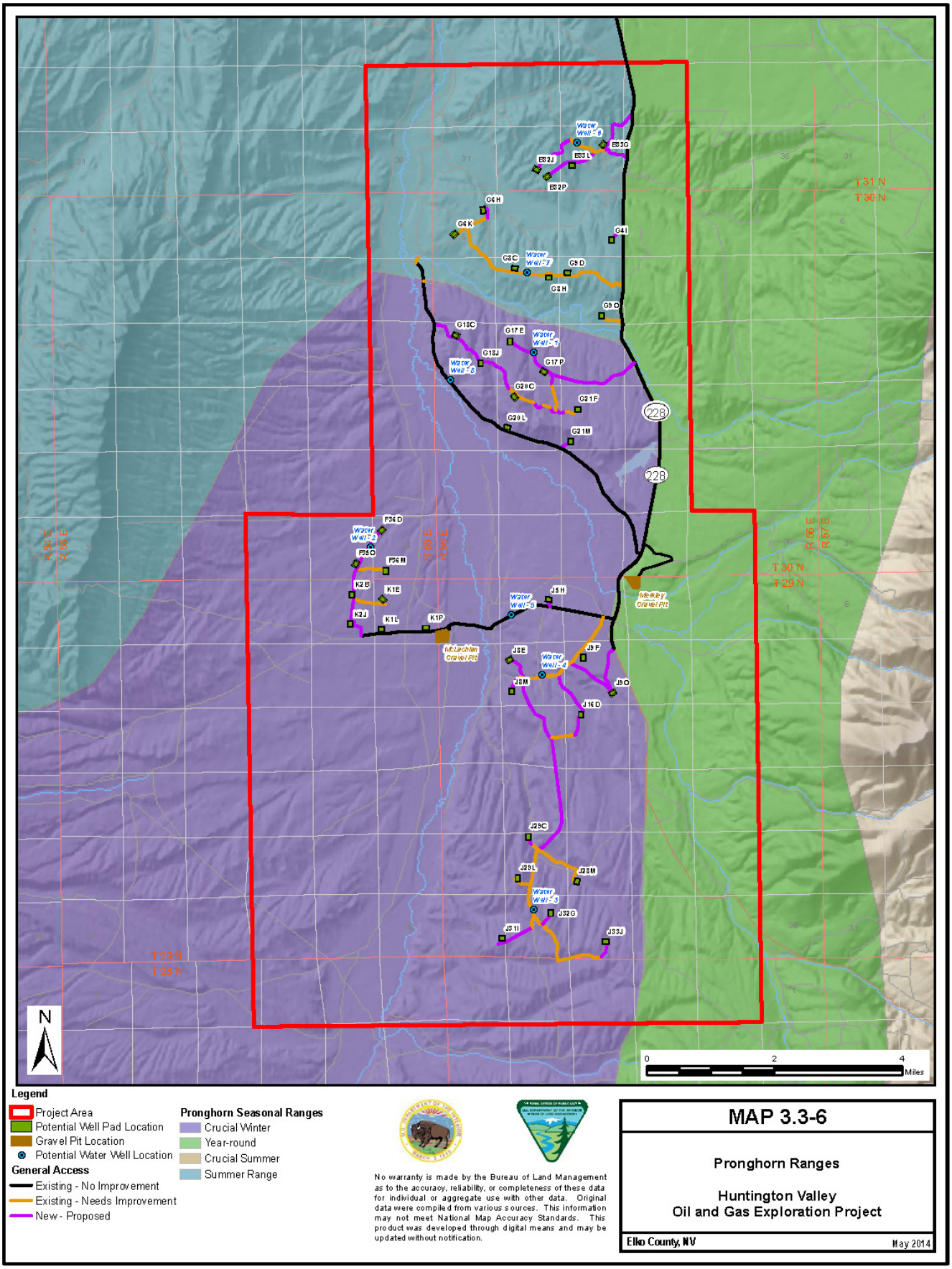
In 2012, the population that includes animals within Hunt Unit 065 was 500 animals. Fawn recruitment within that population in 2012 was very low, 26 fawns per 100 does, but the 2013 population was expected to grow to 550 pronghorn (NDOW, 2013d).

For the population that includes Hunt Unit 102 and 103, fawn recruitment was even lower in 2012 (17 fawns per 100 does), primarily due to drought-related poor range conditions. Although the long-term population trend had been stable, the estimate for 2013 declined to 800 pronghorns, down from 900 animals from the previous year (NDOW, 2013d).

Mule Deer. Most of the Project Area coincides with seasonal ranges used by mule deer. The mule deer population within Hunt Unit 065 utilizes 24,256 acres of winter range, 18,560 acres of transition range, and 8,960 acres of limited use range in the Project Area. Winter ranges are where the majority of animals occur during typical winters, January through April, dependent on snow depths and forage availability (NDOW, 2013c). Transitional ranges are consistently used between other seasonal ranges and limited use ranges are only inhabited occasionally, with low animal density (NDOW, 2013c).

Population estimates for mule deer inhabiting Hunt Unit 065 indicates 700 mule deer in 2012 and 2013 although it appears there was poor fawn production (54 fawns per 100 does in 2011) due in part, to limited winter and spring precipitation in 2011 and 2012 and poor forage conditions.

The population within Hunt Units 102 and 103, east of SR 228, utilizes 8,320 acres of winter range and 3,392 acres of limited use range in the Project Area (NDOW, 2009a). Mule deer in these units mainly utilize foothills of the Ruby Mountains east of the Project Area boundary. There is some incidental use within Huntington Valley, especially in the spring when green up occurs, and a portion of the herd will cross the highway. The majority of mule deer stay within the foothill habitats and would not be affected by the Proposed Action. The population inhabiting Hunt Unit 102 and 103 was 23,000 mule deer in 2012 and 2013 (NDOW, 2013d).



Legend

- Project Area
- Potential Well Pad Location
- Gravel Pit Location
- Potential Water Well Location

General Access

- Existing - No Improvement
- Existing - Needs Improvement
- New - Proposed

Pronghorn Seasonal Ranges

- Crucial Winter
- Year-round
- Crucial Summer
- Summer Range

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

MAP 3.3-6

Pronghorn Ranges

Huntington Valley
Oil and Gas Exploration Project

Elko County, NV — May 2014

Elk. Elk in the Project Area inhabit 11,182 acres of year-round habitat along the base of Cedar Ridge in the west side of Huntington Valley (NDOW, 2009b). The elk population within Hunt Unit 065 that occupies year-round range has not been defined as a part of any group unit and no surveys have been reported although the 2012 population was estimated at 35 elk with 120 elk predicted for 2013 (NDOW, 2013d).

No seasonal elk habitat occurs within the Project Area within Hunt Units 102 and 103. Elk within that population are managed to reduce depredations on agricultural lands and NDOW attempts to eliminate elk or maintain the population at such low levels that depredation does not occur (NDOW, 2013d). Elk in the Ruby Mountains inhabit year-round habitat, mostly within the Humboldt-Toiyabe National Forest.

Mountain Lion. Mountain lions potentially occur within the Project Area but there are no specific seasonal occurrences. Mountain lions may prey on big game wintering within the Project Area as they do elsewhere in Nevada (NDOW, 2013d) but documentation is lacking.

Upland Game and Furbearers. Furbearer species which have been seen in the Project Area include black-tailed jackrabbit, red fox, beaver, mink, and muskrat. Black-tailed jackrabbits are common in Nevada's desert and foothill landscapes. Jackrabbits live in the extreme environments of the desert and chaparral, where temperatures are hot during the day and cold at night, with low annual precipitation. They are common in brushlands, prairies, pasturelands, and meadows throughout much of the western United States. The red fox is a highly adaptable species found in many habitats, including agricultural and shrub dominant vegetation typical of the Project Area. Beavers, mink, and muskrats are semiaquatic herbivorous mammals occurring in creeks and streams with ample vegetative cover.

The rabbit harvest and number of hunters decreased in 2012, with the exception of pygmy rabbits. The sage-grouse harvest and number of hunters also decreased. Three of the species most harvested in 2012 that are known or likely to occur in the Project Area include chukar partridge, mourning dove, and Hungarian (gray) partridge (NDOW, 2013d). Harvest numbers and hunter participation decreased for all species. Harvested migratory waterfowl also occur in the Project Area (HWA, 2012c), including Canada geese, mallard, and northern pintail.

Game Birds. Game bird species include grouse, partridges, and doves, all of which are common in the sagebrush dominant vegetation type typical of the Project Area. Waterfowl in the Project Area are confined to areas with open surface water. Game birds observed in the area include sandhill cranes, trumpeter swans, ruffed grouse, blue grouse, California quail, and Himalayan snowcock.

Non-Game Species. Non-game bird species were discussed under Section 3.3.3, Migratory Birds. Ord's kangaroo rats and Townsend's ground squirrels are common to arid sagebrush and saltbush-greasewood communities, and porcupines inhabit shrubby stream bottomlands (Zeveloff, 1988). Other non-game species occur, including the common sagebrush lizard, Great Basin collared lizard, Great Basin whiptail, western fence lizard, western rattlesnake, horned lizard, bullsnake, gopher snake, and western terrestrial garter snake (NDOW, 2013d; Burton, 2013). The following mammals have been observed in the Project Area: badger, striped skunk, black-tailed jackrabbit, mountain cottontail, coyote, Great Basin ground squirrel, raccoon, Uinta chipmunk, desert cottontail, American deer mouse, Great Basin pocket mouse, white-tailed jackrabbit, and weasel (Burton, 2013).

Fish. In the Project Area, stream flows have been diverted to irrigated agriculture for hay production and many diversion structures are barriers to fish movements (USFWS, 2009). Though data are scant, instream flows in Huntington Creek have been minimal between July and January (Figure 3.3-1) and it is likely that stream flows in tributaries have been even lower, perhaps nonexistent in lower reaches and limiting fish movements between occupied habitats.

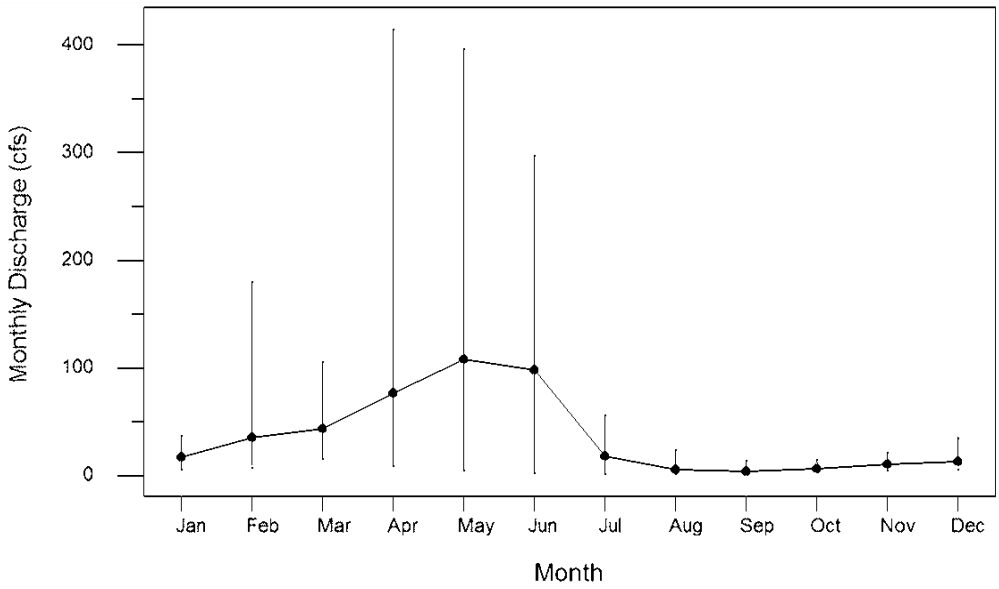


Figure 3.3-1
Average Monthly Discharge (cfs) in Huntington Creek (USGS Gage 10319500) from 1948 to 1972. Vertical lines show maximum and minimum discharges during the period of record

Historical water temperatures in Huntington Creek during May and June 1964 were 70°F (Rush and Everett, 1966) and would be expected to be higher later in the summer. Two tributaries to Huntington Creek, Pearl Creek, and Robinson Creek, are on the 2012 list of impaired waterbodies (NDEP, 2013e) because water temperatures exceeded the standard of 20°C (68°F) for trout waters (see Nevada Administrative Code, Chapter 445A – Water Controls). It appears that migrations of fish into the Project Area would be restricted to periods of high instream flow, given the pattern in Figure 3.3-1. Also, water temperatures in aquatic habitats in the Project Area would favor introduced non-native warmwater species (channel catfish, largemouth bass, smallmouth bass) over coldwater species such as cutthroat trout and rainbow trout.

Zunino/Jiggs Reservoir is stocked with rainbow trout, brook trout, and largemouth bass when it contains water; the reservoir is currently dry but repairs are expected to be completed in 2014. Other non-native species occur in South Fork Reservoir including rainbow trout, brown trout, cutthroat trout (and rainbow-cutthroat hybrids), smallmouth bass, largemouth bass, wipers (hybrid striped-white bass), and channel catfish. Rainbow trout and brook trout have been introduced throughout the Humboldt-Toiyabe National Forest and occur in the Project Area (Elliot and Layton, 2004). Native species in South Fork Reservoir include tui chub, Tahoe sucker, redside shiner, and speckled dace (NDOW, 2010). Rainbow trout, brown trout, cutthroat trout rainbow cutthroat hybrids, channel catfish and small mouth are present in the South Fork Humboldt River. Stocking does not occur in the river but those species migrate upstream and downstream from South Fork Reservoir which is stocked each year (NDOW, 2010). The same migrations by introduced nonnative and native species are also likely to occur within Huntington Creek and portions of its tributaries within the Project Area.

3.3.5.2 Environmental Effects

3.3.5.2.1 Proposed Action Alternative

Game and Non-game Species. Construction and operation of the Proposed Action could directly and/or indirectly affect terrestrial wildlife present in the Project Area in one or more of the following ways:

- Direct mortality by vehicles during construction and operation of the project, and poaching coincidental with increased human use.
- Removal and alteration of vegetation composition and structure of existing habitats, making them less functional for wildlife.
- Decreased habitat use proximate to the project components (within a zone of effect) caused by displacement of animals to alternative habitats.

Direct Mortality. Project-related traffic could result in wildlife mortalities, especially for mammals and reptiles. Species most susceptible to vehicle-related mortality include those that are inconspicuous (lizards, snakes, and small mammals), those with limited mobility, burrowing species (mice and voles), wildlife with behavioral activity patterns (i.e., nocturnal activity) making them vulnerable, and wildlife that may scavenge roadside carrion (Leedy, 1975; Bennett, 1991; Forman and Alexander, 1998). Maintaining speed limits on paved roads and not exceeding 20 mph on unpaved roads should reduce the potential for vehicle collisions with terrestrial wildlife.

Poaching wildlife is a possible consequence of additional human access within wildlife habitats (Comer, 1982). To reduce potential poaching by project workers, Noble would inform employees and contractors through job site safety orientations that harassing (including feeding, approaching, pursuing, or otherwise intentionally disturbing) or shooting wildlife would not be permitted; dogs may not be brought to the Project Area; no firearms would be allowed on-site; and there would be no littering, including trash that was not secured properly and has been dispersed by wind (Noble, 2014). Prohibiting the use of hunting equipment, calls, bow/arrow, traps, snares, firearms, baits, scents, etc. on site would also deter poaching.

Habitat Loss and Alteration. Construction would remove habitats used by wildlife, including migratory birds. Loss of shrub cover would reduce forage for some herbivores (pronghorn, mule deer, pygmy rabbits, sage-grouse), reduce hiding cover and thermal shelter (cottontails, jackrabbits, sage-grouse, horned lizards, and other reptiles, other game and non-game species), and reduce nesting cover and substrate for birds.

The project would remove habitat that is used as seasonal range by big game animals. Seasonal ranges of pronghorn, mule deer, and elk overlap within the Project Area so that project disturbances to one species' seasonal range could affect other species' ranges. Table 3.3-14 summarizes project surface disturbances to seasonal ranges used by pronghorn, mule deer, and elk within the Project Area. Identified disturbance within pronghorn crucial ranges is 297.2 acres (based on 39 well pads, actual disturbance would be less because only 20 well pads would be constructed). That area is approximately 0.7 percent of the crucial winter range within the Project Area. Project effects to other seasonal ranges included in Table 3.3-14 can be interpreted similarly.

Effects to game and non-game species could also extend for the long-term if related to habitat removal, alteration, and/or fragmentation (operation). Non-game wildlife species would potentially be displaced from habitats that are cleared of vegetation; however, displacement should be a short-term effect if related to noise and human presence (construction). Animals could be displaced over the entire production phase due to noise (pump units, generators, heaters, flares on each well pad) and human presence on roads and at well pads.

Invasive non-native species and noxious weeds can interfere with reestablishment of native vegetation species and many weeds are unpalatable to wildlife (Whitson, et al., 1996). Successful restoration of vegetated seasonal ranges would provide more suitable habitat, especially on previously disturbed lands. Full restoration of shrub-dominated habitats would occur over the long-term.

Table 3.3-14
Identified Surface Disturbance in Big Game Seasonal Ranges within the Project Area

Big Game Seasonal Ranges [1]	Existing Seasonal Range in Project Area (acres)		Surface Disturbance in Big Game Seasonal Range (acres)	
	Area	Percent of Project Area	Total Disturbed	Disturbed Percentage of Seasonal Range
Pronghorn[1]				
Crucial Winter Range	40,088.0	63.2	297.2	0.5
Year-round Range	13,729.8	21.6	28.7	<0.1
Summer Range	9,677.2	15.2	102.2	0.2
Total	**63,495.0**	**100.0**	**428.1**	**0.7**
Mule Deer [2]				
Crucial Winter Range	25.4	<0.1	0	0
Winter Range	32,600.3	51.3	253.1	0.4
Transition Range	18,559.1	29.2	159.4	0.3
Limited Use Range	12,320.7	19.5	15.6	<0.1
Total	**63,505.5**	**100.0**	**428.1**	**0.7**
Elk [3]				
Year-round Range	11,181.8	17.6	95.0	0.8

[1] NDOW, 2007.
[2] NDOW, 2009a.
[3] NDOW, 2009b.

Approximately 25 percent of the surface disturbance for new road construction and road improvement is planned for reclamation within one growing season following ground disturbance, and is expected to be re-established within three growing seasons. About 44 percent of surface disturbance associated with well pad construction would be reclaimed after completion of the last well planned for the well pad, which would reduce some of the effects to wildlife. However, wildlife use of reclaimed surface disturbance would depend on many factors including species-specific responses to revegetated species, vegetation cover and density, and vegetation structure; wildlife use of reclaimed surfaces could take a long time.

Zone of Effect. Traffic is expected to affect pronghorn, mule deer, and elk distributions in occupied habitats for some distance away from project components (well pads, gravel pits, roads). Mule deer generally avoid roads (Rost and Bailey, 1979; Easterly et al., 1991). Studies conducted on the effects to mule deer and elk from traffic volumes associated with development of a natural gas well field in Wyoming concluded that a variable "zone of effect" persists beyond the actual physical disturbance of big game habitats (Sawyer et al., 2007; and Sawyer et al., 2009). Elk also avoid roads and traffic (Rost and Bailey, 1979; Lyon, 1983; Rowland et al., 2000) and pronghorn avoid disturbances associated with vehicular traffic, mines, and wellfields (Autenrieth, 1983; Reeve, 1984; Easterly et al., 1991).

Increased vehicular access could induce glucocortioid stress in animals (Creel et al., 2002; Sheriff et al., 2011) in the vicinity of well pads, roads and gravel pits during periods in winter with no timing limitations. Chronic stress might lead to increased mortality. More likely would be increased mortality if animals, especially juveniles, increased their energy expense, especially travelling through snow during winter (Parker et al., 1984) while escaping from vehicles (Hobbs, 1989).

The presence of construction vehicles and pickup trucks is likely to displace pronghorns from home ranges and breeding territories in the vicinity of construction (Reeve, 1984). These effects are expected to be localized and temporary, perhaps lasting as long as the duration of construction although some animals could potentially habituate to consistent, confined, and predictable disturbances (Reeve, 1984). In intensively developed natural gas fields in Wyoming, some pronghorns did not avoid areas with high levels of human activities while other animals completely avoided developed areas (Beckmann and Seidler, 2009) but overall, pronghorn use

of the developed well fields declined over time. The same could occur to pronghorn use of crucial winter range and summer ranges within the Project Area.

Water is generally a limiting factor on pronghorn summer range and higher densities of animals, particularly lactating does with fawns are expected near open water and more succulent riparian vegetation. Displacement of pronghorns from the vicinity of the Project Area, if it occurs, would not affect many animals and the extent of summer habitat does not appear to be a limiting factor for the population. Displacement would not cause local habitat carrying capacity to be exceeded and would not lead to demographic effects to the pronghorn population by increasing mortality (e.g., through stress, predation, disease, or intraspecific competition), decreasing fecundity (e.g., through nutrition deficits during pregnancy and lactation, fetal resorption, fetal abortion), or by increasing emigration.

Big game species tend to move away from areas of human activity and roads, reducing habitat utilization. Displacement of big game is greatest for heavily traveled secondary and dirt roads. Deer displacement distances can reach over 0.5 mile. Deer and pronghorn have been observed to habituate to vehicles as long as traffic is predictable, moving at constant speeds and are not associated with out-of-vehicle activities. In areas where habitats are at, or near, carrying capacity, animal displacement could result in some unquantifiable reductions in local wildlife populations. Displacement of animals away from roads and well pads would reduce the area of functional habitats and affect more pronghorn, mule deer, and elk than was estimated for effects by surface disturbances and direct habitat removal, above.

Wildlife displacement can be a response to noise, although noise and human presence coincide so the effects of either may not be discernible. Most studies of noise effects on wildlife have been related to roads and traffic (reviewed in Federal Highway Administration, 2004). There is no single noise threshold that would apply to all wildlife, and species are affected and respond differently throughout the year during different stages in life cycles. Noise from construction activities and vehicle traffic would be detected by wildlife if above ambient background levels, assumed to be 24 dBA (range of 18 to 24 dBA) during daytime (see discussion for greater sage-grouse, above).

Accidental release of diesel fuel, lubricants, and herbicides within upland habitats could affect soils and vegetation in the vicinity of the spill and released volatile compounds would increase the fire hazard. Spilled compounds could enter drainages by surface runoff during storm events (see below). If it occurred, fire would probably adversely affect sagebrush (and sagebrush-dependent species such a pronghorn, pygmy rabbits, Brewer's sparrows, and sage-grouse) but might lead to more grass that would benefit grazing species such as elk. More than likely, however, expansion of cheatgrass following fire would be most expected which would prevent establishment of native perennial species, decrease forage, and increase risk of frequent high intensity rangeland fires in the future (Knapp, 1996).

Fish. Construction of the Proposed Action could directly and/or indirectly affect aquatic species and habitats present in the Project Area by accidental release of diesel fuel, lubricants, and herbicides in aquatic habitats in the Project Area. The use of herbicides is discussed in the Huntington Valley Integrated Weed Management Plan (Appendix F). Diesel fuel spills could affect freshwater stream macroinvertebrates for more than one year after a spill (Lytle and Peckarsky, 2001). Diesel fuels and lubricating oils are considerably more toxic to aquatic organisms than other, more volatile products (gasoline) or heavier crude oil (Markarian et al., 1994). Proposed disturbances for well pads and access roads would generally be at least 400 feet from all streams, creeks, wetland areas, and Zunino/Jiggs Reservoir. Approximately 3.97 miles of existing road proposed for access is within the 400 foot buffer and no upgrading would occur outside the existing disturbance (Noble, 2014). Approximately 0.04 mile of access road requiring new construction on the eastern edge of the Project Area is proposed within the 400 foot buffer. Fueling of vehicles would not occur within 400 feet of any riparian areas or standing

or flowing surface water (including streams, ponds, springs, seeps and stock reservoirs) (Noble, 2014). Noble would implement and follow a Spill Prevention Plan and a Stormwater Pollution Prevention Plan which would provide measures to prevent spills from reaching surface water.

Magnesium chloride which may be used as a dust suppressant could have negative environmental effects to water quality and aquatic species if over-applied. DirtGlue is a commercial polymer which is non-toxic to plants and animals (DirtGlue Enterprises, 2014) and should have no effect on plants and animals. The dust control program comes under NDEP permitting (Surface Area Disturbance Permit – SAD and Dust Control Plan) and required disclosure of proposed chemical agents.

Mitigation and Monitoring Measures

In addition to the Project Design Features (see Section 2.2.1.6), the BLM has identified the following mitigation measures to further reduce potential impacts to wildlife and fisheries:

- Garbage shall be removed at frequent intervals to avoid attracting scavengers and predators to the pad vicinities. No vehicles will be parked off pad or road disturbance to avoid contamination or fire starts. Employees must stay on pad areas for the duration of shift.
- Any direct mortality within the project footprint shall be reported immediately to the local NDOW Eastern Region Mining Biologist and/or local NDOW wildlife enforcement officer. For migratory birds, and eagles, USFWS must also be notified.
- Vehicle-related mortality shall be reported immediately to the local NDOW Eastern Region Mining Biologist and/or local NDOW wildlife enforcement officer.
- The use of hunting equipment including calls, bow/arrow, traps, snares, firearms, baits, scents, etc. shall be prohibited on-site.
- Noble shall reroute 0.04 mile of proposed new road within the 400-foot riparian and stream buffer.
- Depending on weather conditions, disturbance may be restricted between November 15 and March 16 for Pronghorn crucial winter range. No pad construction or drilling will be allowed in crucial winter habitat if winter conditions meet or exceed 6 inches of snow in the Project Area. If Noble requires pad construction or drilling to take place during such a period, a monitoring measure will come into effect.
- If Noble deems it necessary to either construct pads or drill during adverse winter conditions that may affect Antelope Crucial Winter habitat use (at or above 6 inches of snow in the Project Area). Noble will effect a monitoring effort that will determine impact dispersal of the herd. This monitoring effort could include aerial surveys, ground surveys, collaring, or other methods that are deemed appropriate by BLM, NDOW, and Noble representatives.

3.3.5.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts associated with the Well Pad K2J Access Alternative would be similar to those described above for the Proposed Action Alternative. The additional 0.28 acre of surface disturbance would result in minimal impact to wildlife and no impact to fisheries.

3.3.5.2.3 No Action Alternative

Under the No Action Alternative, there would be no change from either the Proposed Action or the Well Pad K2J Alternative to current conditions for game and non-game wildlife species or habitats within the Project Area.

3.3.5.3 Cumulative Effects

The CESA for wildlife and fisheries, excluding the big game species, encompasses 833,399 acres (see Table 3.1-2 and Map 3.1-5). No direct or indirect impacts would occur to wildlife

and/or fisheries outside of this CESA boundary. Between 1999 and 2013, 158,724 acres (or 19 percent) within the CESA have been impacted by fire, and various vegetation treatments have been applied to 92,201 acres (or 11 percent) (see Table 3.2-16). The surface disturbance associated with the past and present actions and RFFAs (e.g., rights-of-way, pipelines, oil and gas activities, mines) is estimated to be 14,537 acres, and when combined with the 314 acres of surface disturbance proposed for the Project, the total is 14,851 acres or 2 percent of the CESA (see Table 3.2-16). The unincorporated community of Jiggs and Spring Creek, which is a census-designated place, are also located within the CESA as well as portions of SR 227 and 228.

The CESA for big game (i.e., pronghorn, mule deer, and elk) encompasses 6,150,495 acres (see Tables 3.3-15, 3.3-16, and 3.3-17). No direct or indirect impacts would occur to big game outside of this CESA boundary. Several towns (i.e., Wendover, Wells, Elko, Carlin, Jiggs, Spring Creek) and roads (see Maps 3.1-8, 3.1-9, 3.1-10, and 3.1-11) are located within this CESA.

Pronghorn. Within the CESA boundary, 5,393,865 acres have been designated as seasonal ranges. Fire has impacted 1,424,495 acres of the seasonal ranges and vegetation treatments have been applied to 529,376 acres. Table 3.3-15 provides acres of effects for the specific seasonal ranges. The surface disturbance associated with the past and present actions and RFFAs (e.g., rights-of-way, pipelines, oil and gas activities, mines) is estimated to be 130,851 acres, and when combined with the 314 acres of surface disturbance proposed for the Project, the total is 131,165 acres or 2 percent of the seasonal ranges within the CESA (see Table 3.3-15).

Mule Deer. Within the CESA boundary, 2,720,982 acres have been designated as seasonal ranges. Fire has impacted 1,564,243 acres of the seasonal ranges and vegetation treatments have been applied to 550,161 acres. Table 3.3-16 provides acres of effects for the specific seasonal ranges. The surface disturbance associated with the past and present actions and RFFAs (e.g., rights-of-way, pipelines, oil and gas activities, mines) is estimated to be 130,851 acres, and when combined with the 253 acres of surface disturbance proposed for the Project, the total is 131,104 acres or 5 percent of the seasonal ranges within the CESA (see Table 3.3-16).

Elk. Within the CESA boundary, 2,366,755 acres have been designated as seasonal ranges. Fire has impacted 1,278,285 acres of the seasonal ranges and vegetation treatments have been applied to 446,056 acres. Table 3.3-17 provides acres of effects for the specific seasonal ranges. The surface disturbance associated with the past and present actions and RFFAs (e.g., rights-of-way, pipelines, oil and gas activities, mines) is estimated to be 130,851 acres, and when combined with the 95 acres of surface disturbance proposed for the Project, the total is 130,946 acres or 6 percent of the seasonal ranges within the CESA (see Table 3.3-17).

Wildlife (game and non-game) would be affected by the past, present, and reasonably foreseeable future activities, such as: livestock grazing and range improvements, wildland fires, wildlife and game habitat management, fire treatment/seedings, recreation, railroads, utility and other rights-of-way, mineral exploration, oil and gas exploration, wind power, and mining. NDOW, along with land management agencies, has begun working on several large scale mule deer habitat enhancement projects in Management Area 10. One such project, the Overland\Big Wash pinyon-juniper thinning project, was initiated in the vicinity of Overland Pass to improve mule deer winter and transitional range by setting back the successional stage of the area to a more browse dominated site. This effort will also increase wildlife diversity and reduce the potential of catastrophic wildfires by reducing the fuel load. The Overland Pass area is, and has been, an extremely important winter and transitional range for thousands of mule deer that reside in Management Area 10. Initial efforts will be aimed at conducting pinyon and juniper thinning on approximately 3,500 acres within the Overland Pass project boundary. The project is located 15 miles south of the project boundary within the Big Game CESA.

Cumulative impacts from past and present actions and RFFAs within the CESAs could include:

Reduction of suitable habitat/habitat fragmentation. While surface disturbance generally corresponds to associated wildlife habitat loss, accurate calculations of cumulative wildlife habitat loss cannot be determined because the direct impacts of habitat disturbance are species-specific and dependent upon: 1) the status and condition of the population(s) or individual animals being affected; 2) seasonal timing of the disturbances; 3) value or quality of functional habitat the disturbed sites; 4) physical parameters of the affected and nearby habitats (e.g., extent of topographical relief and vegetative cover); 5) value or quality of functional habitats in adjacent areas; 6) the type of surface disturbance; and 7) other variables that are difficult to quantify (e.g., increased noise and human presence). Historic, current, and future developments in the CESAs have resulted, or would result, in the reduction of carrying capacities as characterized by the amount of available cover, forage, and breeding areas for wildlife species. Current or previous surface disturbance in the CESAs primarily results from mining exploration and reclamation as well as oil and gas development. Other activities such as livestock grazing also contribute to cumulative impacts on wildlife habitat (e.g., reduction of biomass).

Animal displacement. Displaced individuals of any species could be forced into less suitable habitats, possibly resulting in subsequent effects of deteriorated physical condition, reproductive failure, mortality, and general stress as important habitat is reduced and animals are subjected to density-dependent effects. Loss of habitat/forage consequently could result in increased competition between and among species for available resources, increased transmission and susceptibility to disease, increased predation opportunities, and emigration. Some wildlife species, such as raptors, would be susceptible to these cumulative impacts since encroaching human activities in the CESA have resulted, or would result, in animal displacement in areas that may currently be at their relative carrying capacity for these resident species. Many of the local wildlife populations (e.g., small game, migratory birds) that occur in the CESAs likely would continue to occupy their respective ranges and breed successfully, although population numbers may decrease relative to the amount of cumulative habitat loss and disturbance from incremental development.

Decreased reproduction success. A decrease in reproductive success and physical condition from increased energy expenditure due to physical responses to disturbance could lead to declining population growth.

Increased vehicle/wildlife collisions. An increase in traffic levels on roadways has the potential to increase vehicle/wildlife collisions and increased human utilization of resources through hunting and other recreational activities that would expose wildlife to potential human harassment, either inadvertent or purposeful.

Increased hunting pressure. An increase in human activity in the CESAs may provide the opportunity for additional hunting pressure on game species such as mule deer, pronghorn, and small game species due primarily to increased public access.

Increased illegal harvest. An increase in human activity in the CESAs may lead to poaching game species such as mule deer, pronghorn, elk, and small game species due to increased public presence and public access.

The primary effects to big game species are direct habitat loss or conversion, habitat fragmentation, or disturbance during critical seasons (rearing of young and critical wintering) of their lifecycles. The cumulative effects, including the Proposed Action and reasonably foreseeable actions, on wildlife are expected to be minor within the scope of the CESAs.

Table 3.3-15
Acres Affected in Pronghorn Ranges within Big Game Cumulative Effects Study Area

Acres within CESA	Acres Disturbed by Fire within Seasonal Ranges [1] (% of CESA or Habitat)	Acres of Vegetation Treatments [2] (% of CESA or Habitat)	Acres of Disturbance within Cumulative Effects Study Area by Past, Present, and RFFA's [3]				Project Effects (Total Acres in Project Area)	Total Cumulative Disturbance Acres (% of CESA)
			Case Type	Authorized & Pending	Closed	Total		
Total Acres: 6,150,495 Crucial Summer: 155,973 (3%) Crucial Winter: 499,808 (8%) Summer: 1,609,958 (26%) Winter: 506,800 (8%) Year Round: 2,552,393 (42%) Total Ranges within CESA: 5,393,865	Total: 1,424,495 (23%) Crucial Summer: 1,134 (1%) Crucial Winter: 195,472 (39%) Summer: 1,131,829 (70%) Winter: 6,999 (1%) Year Round: 80,919 (3%) Acres of habitat within Project Boundary disturbed by fire: Crucial Winter: 1,945 Summer: 748	Total: 529,376 (9%) Crucial Summer: 837 (1%) Crucial Winter: 115.489 (23%) Summer: 403,335 (25%) Winter: 5,848 (1%) Year Round: 22,603 (1%) Acres of vegetation treatments within the Project Boundary: Crucial Winter: 1,273 Summer: 14	Rights-of-Way: Pipelines, Power lines, Fiber Optic Cable, Telephone Lines, Roads, Fences, Railroad	14,870	723	**15,593**	Total: 314 Crucial Summer: 0 (0) Crucial Winter: 297 (40,088) Summer: 102 (9,677) Winter: 0 (0) Year Round: 26 (13,730)	131,165 [4] (2%)
			Oil & Gas; Mines; Mineral Material Sites: Sand, Gravel, topsoil sources and pits	113,033	2,225	**115,258**		

[1] Source: BLM GIS Data. Historic Fires (1999-2013).
[2] Source: BLM GIS Data. Vegetation Treatments (1999-2013).
[3] Reasonably Foreseeable Future Actions (RFFA). Source: BLM GIS Data. Land Lines/Land Points and Mineral Material Sites data (2013). Acres are approximate and are conservative, using the total area of the project boundaries to calculate the surface disturbance rather than the areas within the boundaries actually disturbed by the specific projects.
[4] Total is the sum of 15,593 and 115,258 and 314. Percentage is derived by dividing by 5,393,865.

Table 3.3-16
Acres Affected in Mule Deer Ranges within Big Game Cumulative Effects Study Area

Acres within CESA	Acres Disturbed by Fire [1] (% of CESA or Habitat)	Acres of Vegetation Treatments [2] (% of CESA or Habitat)	Acres of Disturbance within Cumulative Effects Study Area by Past, Present, and RFFA's [3]				Project Effects (Total Acres in Project Area)	Total Cumulative Disturbance Acres (% of CESA)
			Case Type	Authorized & Pending	Closed	Total		
Total Acres: 6,150,495	Total: 1,564,243 (25%)	Total: 550,161 (9%)	Rights-of-Way: Pipelines, Power lines, Fiber Optic Cable, Telephone Lines, Roads, Fences, Railroad	14,870	723	**15,593**	Total: 253	131,104 [4] (5%)
Crucial Summer: 40,443 (1%)	Crucial Summer: 6,822 (17/%)	Crucial Summer: 2,177 (5%)					Crucial Summer: 0	
Crucial Winter: 508,518 (8%)	Crucial Winter: 350,983 (69%)	Crucial Winter: 157,604 (31%)					Crucial Winter: 0 (25)	
Summer: 674,928 (11%)	Summer: 261,255 (39%)	Summer: 91,868 (14%)					Summer: 0 (0)	
Winter: 870,354 (14%)	Winter: 90,170 (10%)	Winter: 35,364 (4%)						
Year Round: 653,739 (11%)	Year Round: 19,151 (3%)	Year Round: 2,308 (0.4%)					Winter: 253 (32,600)	
Total Ranges within CESA: 2,720,982	Acres of habitat within Project Boundary disturbed by fire:	Acres of vegetation treatments within the Project Boundary:	Oil & Gas; Mines; Mineral Material Sites: Sand, Gravel, topsoil sources and pits	113,033	2,225	**115,258**	Year Round: 0 (0)	
	Winter Range: 2,693	Winter Range: 1,287						

[1] Source: BLM GIS Data. Historic Fires (1999-2013).
[2] Source: BLM GIS Data. Vegetation Treatments (1999-2013).
[3] Reasonably Foreseeable Future Actions (RFFA). Source: BLM GIS Data. Land Lines/Land Points and Mineral Material Sites data (2013). Acres are approximate and are conservative, using the total area of the project boundaries to calculate the surface disturbance rather than the areas within the boundaries actually disturbed by the specific projects.
[4] Total is the sum of 15,593 and 115,258 and 253. Percentage is derived by dividing by 2,720,982.

Table 3.3-17
Acres Affected in Elk Ranges within Big Game Cumulative Effects Study Area

Acres within CESA	Acres Disturbed by Fire [1] (% of CESA or Habitat)	Acres of Vegetation Treatments [2] (% of CESA or Habitat)	Acres of Disturbance within Cumulative Effects Study Area by Past, Present, and RFFA's [3]				Project Effects (Total Acres in Project Area)	Total Cumulative Disturbance Acres (% of CESA)
			Case Type	Authorized & Pending	Closed	Total		
Total Acres: 6,150,495	Total: 1,278,285 (21%)	Total: 446,056 (7%)	Rights-of-Way: Pipelines, Power lines, Fiber Optic Cable, Telephone Lines, Roads, Fences, Railroad	14,870	723	**15,593**	Total: 95	130,946 [4] (6%)
Crucial Summer: 67,142 (1%)	Crucial Summer: 5,335 (8%)	Crucial Summer: 1,999 (3%)					Crucial Summer: 0 (0)	
Crucial Winter: 171,049 (3%)	Crucial Winter: 120,165 (70%)	Crucial Winter: 41,868 (25%)					Crucial Winter: 0 (0)	
Summer: 277,790 (5%)	Summer: 204,685 (74%)	Summer: 44,930 (16%)					Summer: 0 (0)	
Winter: 90,757 (2%)	Winter: 1,225 (1%)	Winter: 5,607 (6%)					Winter: 0 (0)	
Year Round: 1,760,017 (29%)	Year Round: 45,801 (3%)	Year Round: 7,636 (0.4%)	Oil & Gas; Mines; Mineral Material Sites: Sand, Gravel, topsoil sources and pits	113,033	2,225	**115,258**	Year Round: 95 (11,182)	
Total Ranges within CESA: 2,366,755	Acres of habitat within Project Boundary disturbed by fire: Year Round: 698	Acres of vegetation treatments within the Project Boundary: Year Round: 472						

[1] Source: BLM GIS Data. Historic Fires (1999-2013).
[2] Source: BLM GIS Data. Vegetation Treatments (1999-2013).
[3] Reasonably Foreseeable Future Actions (RFFA). Source: BLM GIS Data. Land Lines/Land Points and Mineral Material Sites data (2013). Acres are approximate and are conservative, using the total area of the project boundaries to calculate the surface disturbance rather than the areas within the boundaries actually disturbed by the specific projects.
[4] Total is the sum of 15,593 and 115,258 and 95. Percentage is derived by dividing by 2,366,755.

3.4 HERITAGE RESOURCES AND HUMAN ENVIRONMENT

3.4.1 CULTURAL RESOURCES

3.4.1.1 Affected Environment

A Class III Cultural Resource Inventory (BLM Project Number 1-3022) was conducted by CRA in 2013 (Corbeil and Rood, 2013). The area of potential effect (APE) for purposes of cultural resource survey is "the geographical area or areas within which an undertaking may directly or indirectly cause changes in the character or use of cultural resources" (36 CFR 800.16(d)). The APE for this Project includes all of the proposed well pads, gravel pits, and associated access routes. The inventory was completed under Cultural Resource Use Permit No. N-90625 and Nevada State Antiquities Permit No. 615.

The purpose of the Class III inventory was to locate cultural resources, evaluate the eligibility of those resources for inclusion in the National Register of Historic Places (NRHP), analyze the planned project's activities potential effect on Historic Properties (those sites eligible for inclusion in the NRHP) or of undetermined eligibility, and to recommend possible mitigative actions to potential adverse effects.

A Class I Inventory (literature review) revealed several previous Class III inventories and local Tribal ethnography within the current projects' APE had located Historic Properties within and immediately adjacent to the Project Area. These sites include historic settlement, transportation, and land use sites as well as pre-contact lithic scatter sites. Documented historic sites relating to settlement and transportation in the area include segments of the Hill-Beachy road and telegraph line, the Elko-Hamilton stage road, the Elko-Eureka stage road, and the CNHT Hastings Cutoff. Additional sites include historic farmsteads and sites associated with agricultural land use activities.

The Class III inventory was conducted of the projects' proposed infrastructure areas on public lands and where landowner consent for access could be obtained. The Class III cultural resource inventory of the proposed well pads and access roads encompassed 1,906 acres of land. CRA inventoried 43 locations for the proposed well pads with 27 on public land (590 acres) and 16 on private land (307 acres). A total of 47.43 miles of potential access roads were inventoried using a 200 foot wide corridor equaling approximately 1,009 acres. The two gravel pits and access to them were also inventoried for an additional 67.88 acres.

Forty three potential well pad locations were surveyed for cultural resources during the Class III inventory, including four well pads on private land that have since been dropped as alternatives due to project redesign. On average, a 20 acre area was inventoried at each proposed well pad location allowing for movement of the well pad disturbance footprint within that surveyed 20 acre block should topographical, biological, archaeological, or existing infrastructure issues arise at the preferred location.

3.4.1.2 Environmental Effects

3.4.1.2.1 Proposed Action Alternative

Ten sites, including two revisited previously recorded sites, were recorded during this cultural resource inventory. Eight of these sites are pre-contact lithic scatters and two sites are historic. Sites 26EK14537, 26EK14555, 26EK13524, 26EK13518, and 26EK13524 will be managed and protected under 36 CFR 800 (either eligible or of undetermined eligibility for inclusion in the NRHP). The remaining five pre-contact sites (26EK14534, 26EK14535, 26EK14536, 26EK14538, and 26EK14539) are determined to be not eligible for inclusion in the NRHP. The

six isolated finds located and documented are by definition not eligible for inclusion in the NRHP and will not be managed.

Direct effects to known Historic Properties would be avoided through project design. Indirect effects and potential future effects to known Historic Properties would be avoided or ameliorated through the mitigation measures as defined below.

Mitigation Measures

The following mitigation measures are designed to minimize the potential for direct effects to accidental finds, previously unrecorded sites, or indirect effects to known Historic Properties or sites of undetermined eligibility. These mitigation measures would apply to the entire Project Area:

- A 100 foot (30 meter) buffer zone shall be established around the exterior perimeter of sites 26EK14537, 26EK14555, 26EK13518, and 26EK13524. The buffer zone external boundary, including all internal areas, shall be off limits to all ground disturbing activities, including but not limited to driving, parking, grading/blading, excavation, equipment or supply storage, or any other activity that can break, damage, relocate, reposition, disturb or move archaeological surface artifacts or deposits. Any such activities are prohibited unless authorized in writing by the BLM AO.
- Noble shall not disturb, alter, injure or destroy any NRHP eligible and/or scientifically important historic or archaeological site, structure, building, object or artifact within the Project Area. Noble shall be responsible for ensuring that its employees, contractors or any others associated with the Proposed Action do not collect artifacts, or damage or vandalize archaeological, historical or paleontological sites or the artifacts within them. Should damage to cultural resources occur within the above areas during the period of construction, operation, maintenance or rehabilitation due to the unauthorized, inadvertent or negligent actions of Noble, Noble's contractors, or any other project personnel, Noble shall be responsible for costs of rehabilitation or mitigation. Individuals involved in illegal activities would be subject to penalties under the Archaeological Resources Protection Act (16 United States Code [USC] 470ii), the FLPMA (43 U.S.C. 1701), Native American Graves Protection Act - NAGPRA (16 USC 1170) and other applicable statutes.
- Noble shall provide training to ensure that all its personnel and all the personnel of its contractors and subcontractors are directed not to engage in the illegal collection of historic and prehistoric materials. Subsequent hires shall also be required to have similar training. Training can be in association with Noble's safety and or related job training and project orientation. Noble shall cooperate with BLM to ensure compliance with the Archaeological Resources Protection Act of 1979 (16 USC 470) on Federal lands and with Nevada Revised Statutes (NRS) 381 and 383 for private lands.
- An archaeological and/or Tribal monitor, funded by Noble, may be required during active construction at historic properties located within close proximity to ground disturbing activities. BLM would make determinations regarding monitoring needs on a case-by-case basis.
- When previously unidentified cultural resources are discovered or an unanticipated impact situation occurs, all project activities within 328 feet (100 meters) of the discovery/impact shall cease immediately and Noble or its authorized representative shall secure the location to prevent vandalism or other damage. Pursuant to 43 CFR §10.4(g), Noble shall notify the BLM AO, by telephone and with written confirmation, immediately upon the discovery of human remains, funerary objects, sacred objects, or

objects of cultural patrimony (as defined in 43 CFR §10.2), and any previously undocumented archaeological or historic sites. Activity at the location shall be suspended until after the discovery has been evaluated, any necessary mitigation measures completed and the BLM AO has issued a written Notice to Proceed. Human remains, funerary objects, sacred objects, or objects of cultural patrimony found on federal land would be handled according to the provisions of NAGPRA and its implementing regulations (43 CFR §10). Human remains and funerary objects found on state or private land shall be handled according to the provisions of Nevada statute NRS 383.150 to 383.190.

- Noble shall not knowingly disturb, alter, injure, or destroy any scientifically important historical or archaeological site, structure, building or object; or cave related site on public lands. If any previously unidentified cultural, or cave related resource is discovered that might be altered or destroyed by construction, all activity shall immediately stop in the vicinity of the discovery and the procedures outlined in the preceding paragraph shall be implemented regarding unanticipated discoveries pursuant to 43 CFR §10.4(g).

3.4.1.2.2 Well Pad K2J Access Alternative

Effects to cultural resources under the Well Pad K2J Alternative would be the same as those described above for the Proposed Action Alternative.

3.4.1.2.3 No Action Alternative

Under the No Action Alternative, neither the Proposed Action Alternative nor the Well Pad K2J Access Alternative would occur and, therefore, no direct or indirect impacts to cultural resources would result from increased access. Illegal collection and vandalism could still occur although access would not be increased.

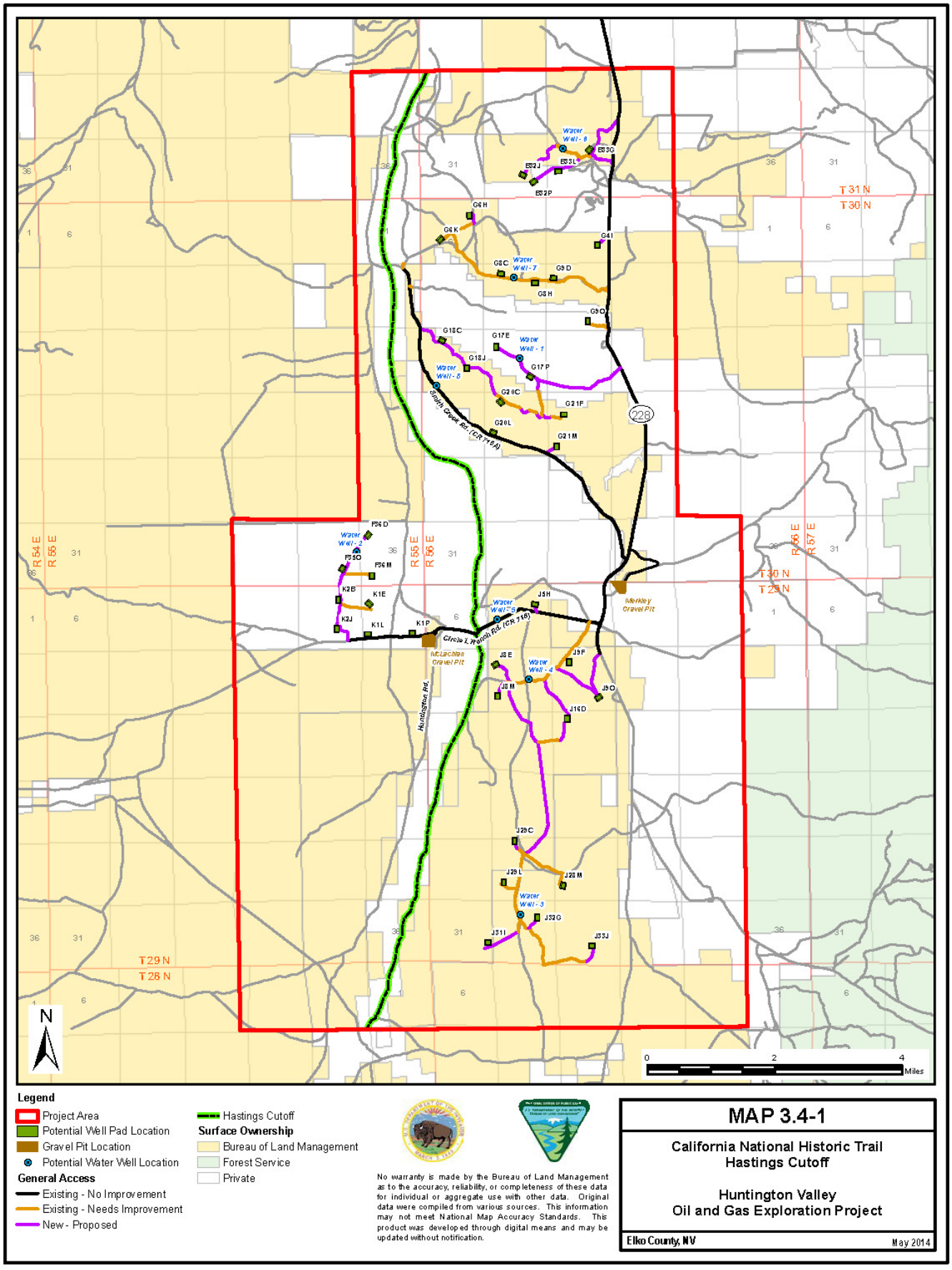
3.4.1.3 Cumulative Effects

The CESA for cultural resources is the Project Area (see Table 3.1-2). As directed by law, cultural resources inventories are conducted for any actions involving federal lands, and adverse effects to historic properties avoided or mitigated as appropriate. Avoidance through project redesign is the preferred method of mitigation; however, when avoidance is not feasible, data recovery or other forms of mitigation are implemented prior to ground-disturbing activities. Previously unknown NRHP-eligible sites potentially discovered during construction activities would be mitigated in accordance with the defined mitigation measures (Section 3.4.1.2.1). In following these measures, the proposed project is not expected to cumulatively contribute to direct effects to historic properties. In following these measures, the Proposed Action is not expected to cumulatively contribute to direct effects to historic properties. Cumulative indirect effects would increase in the form of visual and audio intrusion from the placement of proposed project infrastructure.

3.4.2 NATIONAL HISTORIC TRAILS

3.4.2.1 Affected Environment

Although it is part of the CNHT, the Hastings Cutoff is not part of a congressionally designated route. The route of the CNHT Hastings Cutoff that is subject to the assessment conducted by CRA (Corbeil and Rood, 2013) includes the portion that crosses through the Project Area as plotted by the NPS, Geographic Resources Division, Trails and Routes (Map 3.4-1). Within the Project Area, approximately 2,400 meters (1.5 miles) of the route crosses private land, where permission for access was denied. That portion of the route was not included in the assessment.



Legend

- Project Area
- Potential Well Pad Location
- Gravel Pit Location
- Potential Water Well Location

General Access

- Existing - No Improvement
- Existing - Needs Improvement
- New - Proposed
- Hastings Cutoff

Surface Ownership

- Bureau of Land Management
- Forest Service
- Private

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

MAP 3.4-1

California National Historic Trail
Hastings Cutoff

Huntington Valley
Oil and Gas Exploration Project

Elko County, NV

May 2014

An aspect of the larger network of routes and trails that comprise the CNHT, the Hastings Cutoff is eligible for inclusion in the NRHP under Criteria A–D as a historic site, important for its association with the broad patterns of westward migration, including the influential schemes of Lansford Hastings and tragedy of the Donner Party, as well as its potential to yield important information regarding the scope and scale of these processes before it was supplanted by other routes and modes of transportation. However, the route's relatively light traffic and limited duration as a migrant route, in comparison to the more heavily trafficked sections of the CNHT, and the subsequent uses of the land within and along its actual route have compromised the integrity of all but a small section of the trail (trace element) within the Project Area.

Although neither the State of Nevada nor Elko County has noise regulations governing the acoustic environment of oil and gas operations, the BLM and the NPS recognize that the soundscape is an important part of the visitor experience, and the NPS has identified the natural soundscape within national parks as one of the resources it must protect (BLM 2012c; NPS 2013).

The noise assessment is applied to the Construction/Drilling Phase of the Project as well as the Production/Operations phase. Both of these phases have associated truck and vehicle traffic. The truck and vehicle traffic noise was not analyzed due to difficulties analyzing this type of noise in this particular situation.

To assess potential audible effects, CRA compared baseline auditory data for the Project Area with an assessment of the likely decibel encroachment levels that may be created by the proposed project, determined the level of potential decibel encroachment along the entire route of the trail and on the trace element that may be generated by the construction and production phases of the project, and assessed the potential impact and effects of the potential decibel encroachment on the Hastings Cutoff route and the intact trace element.

The auditory assessment included the collection of baseline auditory data at 10 KAPs along the entire portion of the Hastings Cutoff within the Project Area. The determination of potential decibel encroachment on the Hastings Cutoff was generated by the proposed disturbance through the creation of noise propagation models reflecting the predicted decibel levels created by the Project.

Along the length of the trail, ambient or baseline noise levels averaged 19.3 dBA across the ten KAPs and ranged between 17.9 to 23.6 dBA depending on the KAP and wind conditions (HWA, 2013b). The overall ambient audible environment was only minimally affected by traffic on the two-track and gravel roads near the KAPs, and ranching activity did not discernibly alter the audible environment along the trail route at the time of the monitoring. In spite of the considerable degree of landscape change within the corridor and the active use of large sections for agriculture, the existing ambient audible environment is relatively quiet.

3.4.2.2 Environmental Effects

3.4.2.2.1 Proposed Action Alternative

CRA completed a visual and auditory assessment of the Project Area to identify potential adverse visual and auditory impacts of the project to the CNHT Hastings Cutoff and to make recommendations regarding mitigation of adverse effects or adverse impacts (Williamson et al., 2013).

Visual. The visual assessment used Visual Resource Management (VRM) and scenic quality ratings, two dimensional line of sight modeling, viewshed simulations modeled by GIS software, and photographic simulations of project infrastructure. CRA followed the methods outlined in Manual H-8410-1 Visual Resource Inventory (BLM, 1986b) and Manual 8400 Visual Resource

management to conduct the scenic rating evaluations and visual contrast ratings analysis (BLM, 1984 and 1986b). The objectives of the VRM system are to minimize the visual impacts of surface disturbing activities and to maintain scenic values on public lands.

The *Class III Inventory and Evaluation of the California Trail, Bureau of Land Management, Elko District* (which included a Visual Resource Inventory) that was conducted for the Elko District BLM in 2011 did not include the Hastings Cutoff portion of the trail (Fryman and Call, 2011). Visual Resource Inventory helps establish the management objectives for a given area. A draft visual inventory report on file with the BLM Tuscarora Field Office identified Scenic Quality Rating Units that included the Project Area. The Project is within Scenic Quality Rating Unit 40. That report also delineated the Project Area as having Class III VRM objectives (BLM, 2006). This is consistent with the Manual 6280 directive that states areas with a National Historic Trail should be managed at a minimum as Class III or those Classes (I or II) that are more visually protective (BLM, 2012c).

Although a Trailwide Comprehensive Plan has not been completed and the National Trail Corridor has not been defined for the Hastings Cutoff, Manual 6280 states that the visual analysis inventory will be conducted within the National Trail viewshed until such a corridor is established (BLM, 2012c). CRA selected 37 KOPs placed along the length of the Hastings Cutoff to evaluate the scenic quality of the viewshed. The selection of the KOPs took several factors into account following methodology in Manual 6280 that describes how to implement a visual inventory.

The visual elements of the four distance zones can generally be described as follows:

- Foreground: At this distance, details of trees, shrubs, wildflowers, and animals are visible to an observer and project features are visually dominant.
- Middleground: At this distance, project features may still be dominant but intervening scenery detracts from the attention given to project features.
- Background: At this distance, details of ground cover are no longer apparent and an observer may or may not notice project features. Intervening topography and vegetation may obscure project infrastructure.
- Seldom Seen: At this distance, only general topography and vegetation patterns are visible to an observer.

CRA ran several viewshed simulations. After the viewshed modeling, scenic quality evaluation of the existing conditions, visual contrast rating worksheets, and photographic simulations, CRA arrived at conclusions regarding the potential visual contract posed by the Proposed Action at each of the 37 KOPs. The degree of contrast criteria was utilized to determine the adverse effect or adverse impact posed by the Proposed Action to the Hastings Cutoff and the trace element. The degree of contrast criteria is in keeping with that outlined in BLM Manual 8431 and is summarized in Table 3.4-1.

Table 3.4-1
Degree of Contrast Criteria

Degree of Contrast	Criteria
None	The element contrast is not visible or perceived.
Weak	The element contrast can be seen but does not attract attention.
Moderate	The element contrast begins to attract attention and begins to dominate the characteristic landscape.
Strong	The element contrast demands attention, will not be overlooked, and is dominant in the landscape.

The visual impact assessment demonstrated that during construction there would be a temporary adverse impact or a temporary no adverse impact to the trail at 24 well pads. It also demonstrated that there would be an adverse effect during production at eight of the well pads. Subsequently, two well pads (J7F and J5N) originally included in the Proposed Action were removed based on recommendations to abandon leaving 22 well pads with effects during the Construction/Drilling Phase and six well pads with an adverse effect during Production/Operations Phase.

Although in some cases during the Construction/Drilling Phase, the element contrast would demand attention, would not be overlooked, and would be dominant in the landscape, the drilling rig is a transitory activity and would be removed from the well pad after 48 to 65 days. Only two wells will be drilled at any one time during the project and they will not necessarily be in proximity to one another, so there will not be a time when all of the drilling rigs would be a bold contrast on the horizon simultaneously.

Although the assessment showed proposed well pad G6K would be visible from KOP, none with a weak degree of contrast, it was determined that the element contrast can be seen but does not attract attention and therefore, no recommendations were made for this well pad. Proposed well pads G20L, K1P, J5H, J8E, and J8M would be visible from several KOPs with weak to moderate degree of contrast. For these proposed well pads, the recommendation is to implement the following which has already been included as Project Design Features in the MSUPO (Noble, 2014):

- Use low profile 10 ft. (3 meter) high tanks instead of the standard 20 ft. (6 meter) storage tanks.
- Use paint colors chosen by the BLM to blend with the surrounding landscape.
- Avoid clearing the pad in a geometric shape, and instead utilize a more organic outline with rounded corners.
- Leave as much vegetation in place as possible and reseed with native species during the interim reclamation as well as during final reclamation.

In addition to the recommendations listed above, it is recommended that proposed well pad J8E be located in the northwest corner of the 20-acre survey block so that the well pad is out of sight of a visitor to the auto-tour marker. This is also included as a Project Design Feature in the MSUPO (Noble, 2014).

Although the visual effect of the undertaking must be evaluated as part of a broad view of the undertaking's impact and its long-range implications, some potential impacts from Project activities are difficult to assess. Following guidance from BLM archaeologist (Bigelow, 2013), the potential effects of dust, traffic motion, and flaring are identified and acknowledged but are not analyzed in depth as part of the visual contrast analysis.

Auditory. CRA assessed potential audible effects and impacts from the KAPs along the trail route that would consider the trail setting and how a trail visitor interacts with the trail (BLM 2012c; NPS 2011). CRA also considered the way in which the introduction of new sounds would affect the visitors' experience when traversing the trail through the Project Area, assuming the visitor could access the private lands through which the majority of the route passes.

The undertaking involves the development and operation of a series of well pads that are generally located in clusters, linked by a network of what would be new, improved and existing roads. Because of their spatial arrangement, the potential audible effects would emanate from five distinct clusters of wells, four of which are located east of the route of the Hastings Cutoff, and one of which is located at its center and is bisected by the trail route. The likely audible

effects from generator noise associated with the eight proposed water well locations, which is less consequential, would emanate from seven clusters.

The noise propagation models found little change in the baseline audible environment from historic conditions. The overall ambient audible environment was only minimally affected by traffic on the two-track and gravel roads near the KAPs, and ranching activity did not discernibly alter the audible environment along the trail route at the time of the monitoring. In spite of the considerable degree of landscape change within the corridor and the active use of large sections for agriculture, the existing ambient audible environment is relatively quiet.

Construction of the Proposed Action would increase noise levels in the vicinity of project activities. Construction noise levels are rarely steady in nature, but instead fluctuate depending on the number and type of equipment in use at any given time. There would be times when no large equipment is operating and noise would be at, or near, ambient levels. In addition, construction-related sound levels would vary by distance.

Noise encroachment modeling found that the drilling and operation of the well pads and water wells will have no significant audible effect to the Hastings Cutoff route or trace element. The trace element in particular is well removed from any roadway associated with the development and operation of the project, and, therefore, will not be subject to any adverse auditory effects.

The project's design already incorporates many proactive engineering features intended to reduce auditory impacts, such as using propane tanks at water well pads rather than diesel generators, onsite housing for workers to greatly reduce vehicle trips during construction and internal flaring during production.

BLM standards for oil and gas development require minimization efforts as a default practice, and require noise suppression devices (such as mufflers) be used on all internal combustion engines and certain compressor components, in addition to requiring applicants to consider siting their facilities to reduce audible effects and other minimization measures be designed into the projects, as necessary.

Summary. All portions of the Hastings Cutoff trail and trace element would be avoided, regardless of eligibility, by pad relocation and expanded survey of selected well pads and access roads. With the implementation of the project design features included in the MSUPO (Noble, 2014), the Hastings Cutoff trail and trace element would not be directly affected by the Proposed Action.

The Criteria of Adverse Effect was applied to assess the potential for the Proposed Action to detract from the qualities that constitute the significance of the trace element. Based on the results of the field survey, it was found that the Proposed Action would not result in any direct effects to any intact high-potential segment, route, site or historic site associated with the Hastings Cutoff. The Proposed Action would not result in alteration of, destruction of, or damage to the intact trace element because, following the guidance of the BLM Tuscarora Field Office, the Proposed Action was preemptively redesigned to completely avoid any impact to the trace element by 300 feet (90 meters). Further, the Proposed Action would not result in deterioration of the trace element in any way and would not result in the lease or sale of property out of federal ownership or control. Therefore, the Proposed Action would not result in the removal of the intact portion of the Hastings Cutoff from its historic location, a key aspect of the site's integrity. Given the spatially discrete nature of the intact trace remnant and the applicable qualities of integrity (setting, location, design, feeling, and association), the construction and operation of the Proposed Action would not alter any of the physical features of the trace element that contribute to its historical significance.

Mitigation Measures

Mitigation of any potential indirect effects to the CNHT will be defined within an MOA between the Elko District BLM, the Nevada State Historic Preservation Officer, the National Park Service Trails, and other invited signatories and concurring parties as appropriate prior to Project implementation.

3.4.2.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts associated with the Well Pad K2J Access Alternative would be similar to those described above for the Proposed Action Alternative. The additional 0.28 acre of surface disturbance and surface disturbance overall would be closer to the CNHT than the Proposed Action Alternative but would not result in an additional effects to the CNHT.

3.4.2.2.3 No Action Alternative

Under the No Action Alternative, neither the Proposed Action Alternative nor the Well Pad K2J Alternative would occur and therefore, no direct or indirect impacts to cultural resources would result from increased access. Illegal collection and vandalism could still occur although access would not be increased.

3.4.2.3 Cumulative Effects

The CESA for the CNHT Hastings Cutoff is 10,868 acres and includes a 0.5-mile buffer centered on the trail (see Table 3.1-2 and Map 3.1-4). Within the CESA, 428 acres have been impacted by fire and vegetation treatments have been applied to 312 acres.

Historic actions that have created cumulative effects to the CNHT Hastings Cutoff within the CESA include: wildland fire management, rangeland management and use, homesteading, and roads. These types of development could have caused direct impacts through the loss of segments of the CNHT, infringement on the audio and visual integrity of portions of the trail, and (limited) loss of viewscape integrity.

Presently, there are areas of the CNHT Hastings Cutoff that are in near pristine condition with no effects other than natural and environmental degradation through time and weathering. Known future potential effects to the CNHT Hastings Cutoff could come from domestic oil and gas exploration and production. The BLM knows of one other proposal outside the CESA boundary (Cedar Ridge Well), the access to which will cross over the CNHT on existing roads. Cumulative effects to cultural resources within the CESA would be minimal.

Known current and planned activities with the potential to impact the CNHT outside the CESA, but with the Elko BLM District include the planned Marys River Oil and Gas Exploration Project and the planned Newmont Long Canyon Mine. Both of these projects will have indirect impacts to the CNHT's visual and auditory integrity but will not directly affect the analysis within the CESA.

In summary, the CNHT Hastings Cutoff has been affected over time from human ranching, farming, and other effects as listed above. All of the above mentioned effects would continue to occur under the No Action Alternative. Both the Proposed Action and the Well Pad K2J Access Alternative would avoid direct contact with the CNHT; therefore, there should be no incremental increase in direct cumulative effects. Indirect cumulative effects could arise from visual and auditory impacts associated with proposed infrastructure placement. Further cumulative indirect effects could increase with the number of pads put into exploration and/or production beyond pads K2J and K1L.

3.4.3 NATIVE AMERICAN CONCERNS

3.4.3.1 Affected Environment

Native American ethnographic resources are associated with the cultural practices, beliefs, and traditional history of a community. These resources can span timeframes from pre-contact (prior to Euro-American contact), at-contact, and post-contact eras. Examples of ethnographic resources can include places known from oral histories; places of traditional use; large areas, such as landscapes and viewscapes; sacred sites and places used for religious practices; social or traditional gathering areas; natural resources such as plant materials or clay deposits; and places and natural resources traditionally used for non-ceremonial uses such as trails or camping locations.

The landscape in which the Proposed Action would occur is the traditional homeland of the Te-Moak Tribe of Western Shoshone Indians of Nevada. By common understanding amongst the constituent Bands of the Te-Moak (Elko Band, Battle Mountain Band, Wells Band, and South Fork Band), this region is specific to the people of the South Fork Band whose Colony is located in Huntington Valley near the town of Lee. The Proposed Action would avoid areas containing concerns of the South Fork Band.

The NHPA and NEPA mandated tribal consultation and information sharing has occurred since the inception of this analysis (see CHAPTER 4 – TRIBES, INDIVIDUALS, ORGANIZATIONS, OR AGENCIES CONSULTED).

3.4.3.2 Environmental Effects

3.4.3.2.1 Proposed Action Alternative

Through consultation and information sharing with the appropriate Tribal and Band governments, and the utilization of Band government approved (by Resolution) monitor/contractors, all Native American issues of concerns were identified both through consultation and through in-the-field investigation and avoided by project design. Indirect effects may include an on-going heightened awareness, and therefore an increased level of interference with items of Native American concern within the Project Area after the termination of the Project.

Mitigation Measures

In addition to the Project Design Features (see Section 2.2.1.6), the BLM has identified the following mitigation measures to reduce potential effects to Native American Concerns:

- Noble shall not disturb, alter, injure or destroy any NRHP eligible and/or scientifically important historic or archaeological site, structure, building, object or artifact within the Project Area. Noble shall be responsible for ensuring that its employees, contractors or any others associated with the Proposed Action do not collect artifacts, or damage or vandalize archaeological, historical or paleontological sites or the artifacts within them. Should damage to cultural resources occur within the above areas during the period of construction, operation, maintenance or rehabilitation due to the unauthorized, inadvertent or negligent actions of Noble, Noble's contractors, or any other project personnel, Noble shall be responsible for costs of rehabilitation or mitigation. Individuals involved in illegal activities would be subject to penalties under the Archaeological Resources Protection Act (16 United States Code [USC] 470ii), the FLPMA (43 U.S.C. 1701), Native American Graves Protection Act - NAGPRA (16 USC 1170) and other applicable statutes.

- When previously unidentified cultural resources are discovered or an unanticipated impact situation occurs, all project activities within 328 feet (100 meters) of the discovery/impact shall cease immediately and Noble or its authorized representative shall secure the location to prevent vandalism or other damage. Pursuant to 43 CFR §10.4(g), Noble shall notify the BLM AO, by telephone and with written confirmation, immediately upon the discovery of human remains, funerary objects, sacred objects, or objects of cultural patrimony (as defined in 43 CFR §10.2), and any previously undocumented archaeological or historic sites. Activity at the location shall be suspended until after the discovery has been evaluated, any necessary mitigation measures completed and the BLM AO has issued a written Notice to Proceed. Human remains, funerary objects, sacred objects, or objects of cultural patrimony found on federal land would be handled according to the provisions of NAGPRA and its implementing regulations (43 CFR §10). Human remains and funerary objects found on state or private land shall be handled according to the provisions of Nevada statute NRS 383.150 to 383.190.
- Noble shall not knowingly disturb, alter, injure, or destroy any scientifically important historical or archaeological site, structure, building or object; or cave related site on public lands. If any previously unidentified cultural, or cave related resource is discovered that might be altered or destroyed by construction, all activity shall immediately stop in the vicinity of the discovery and the procedures outlined in the preceding paragraph shall be implemented regarding unanticipated discoveries pursuant to 43 CFR §10.4(g).

3.4.3.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts to Native American Concerns under the Well Pad K2J Access Alternative would be similar to those described above for the Proposed Action Alternative. The additional 0.28 acre of surface disturbance would result in minimal impact to Native American Concerns.

3.4.3.2.3 No Action Alternative

Under the No Action Alternative, there would be no effects from either the Proposed Action Alternative or the Well Pad K2J Access Alternative to Native American Concerns in the Project Area. Effects to Native American Concerns would be continued natural environmental changes and resultant decay to organic elements and displacement of surface materials.

3.4.3.3 Cumulative Effects

The CESA for Native American Concerns encompasses 833,399 acres (see Table 3.1-2 and Map 3.1-5). Between 1999 and 2013, 158,724 acres (or 19 percent) within the CESA have been impacted by fire, and various vegetation treatments have been applied to 92,201 acres (or 11 percent) (see Table 3.2-16). The surface disturbance associated with the past and present actions and RFFAs (e.g., rights-of-way, pipelines, oil and gas activities, mines) is estimated to be 14,537 acres, and when combined with the 314 acres of surface disturbance proposed for the Project, the total is 14,851 acres or 2 percent of the CESA (see Table 3.2-16). The unincorporated community of Jiggs and Spring Creek, which is a census-designated place, are also located within the CESA as well as portions of SR 227 and 228.

Increased human presence may affect items of Native American concern (including but not limited to Historic Properties) in the form of greater exposure to illegal collection, vandalism, other illegal activities, and indirect effects from legal activities. Cumulative effects for Native American Concerns under the No Action Alternative would be limited to continued natural degradation. As described above, the Proposed Action and the Well Pad K2J Access

Alternative would avoid items of Native American Concern. Therefore any cumulative effects would be minimal.

3.4.4 PALEONTOLOGICAL RESOURCES

3.4.4.1 Affected Environment

Paleontological resources are the fossilized remains of invertebrate and vertebrate animals and plants, including casts and molds. This resource constitutes a fragile and nonrenewable scientific record of the history of life on earth. Once damaged, or improperly collected or recorded, their scientific value is greatly reduced or lost forever.

The BLM has adopted the Potential Fossil Yield Classification (PFYC) system to identify and classify fossil resources on federal lands (BLM, 2007b). Paleontological resources depict a moment in geologic time that is definitively associated to the geologic strata that contain them (see Section 3.2.2). One might expect to find certain fossils of a specific age within appropriate strata of the same age; conversely, some designated fossils of abundant and wide-spread distribution serve as marker fossils to provide age correlation between strata. The PFYC system is a means by which to classify geologic units based upon the relative abundance of vertebrate fossils or scientifically significant (plant and invertebrate) fossils and their sensitivity to adverse impacts. A higher class number indicates higher potential for presence. The PFYC system is not intended to be applied to specific paleontological localities nor do a few widely scattered important fossils or localities necessarily indicate a higher class rating. The PFYC rating classification is intended to provide baseline guidance for predicting, assessing and mitigating paleontological resources. The classification must be considered at an intermediate point in the analysis and should be used to assist in determining the need for further mitigation assessment. The PFYC system is presented Table 3.4-2.

Table 3.4-2
PFYC Descriptions

PFYC Class	Category	Description
1	Very low	Geologic units are not likely to contain recognizable fossil remains.
2	Low	Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils (plant and invertebrate).
3	Moderate or unknown	Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential.
4	High	Geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability. Surface disturbing activities may adversely affect these resources.
5	Very High	Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils of scientifically significant invertebrate or plant fossils, and that are at risk of human-caused adverse impacts or natural degradation.

In the Elko District, paleontological resources occur in sediments and tuffaceous sediments throughout the Tertiary. Fossilized fish are known to occur with plant fossils in the Oligocene Elko Formation in silty shales but this formation does not outcrop in or near the Project Area.

Fossils of vertebrates, including varieties of extinct camelids, antelope and ancestral horses, have been found in tuffaceous siltstones, sandstones and limestone within the Carlin, Humboldt and similar Miocene-aged strata throughout the district. Limited outcrop of this sequence of

strata is mapped in the very north of the Project Area, and no disturbance is proposed in the outcrops.

Remnants identified as mastodon remains have been found in Pliocene sands in Spring Creek, Nevada. If dated correctly, these fossils represent one of only a dozen or so American Mastodons that date to this time period. It is the first well-documented occurrence in Nevada and in the Great Basin. Because so little scientific data exist with respect to the recognized occurrence, tuffaceous strata in the north of the Project Area is designated a "3" rating in the PFYC system.

Most of the Project Area is overlain by thick alluvium, which is deposited by streams more conducive to dispersal and disintegration of animal or plant remains than to their burial and preservation.

3.4.4.2 Environmental Consequences

3.4.4.2.1 Proposed Action Alternative

It is not anticipated that surface disturbing activities would unearth Quaternary fossils.

Mitigation Measures

The BLM has identified the following measure to mitigate effects to paleontological resources:

- Should paleontological resources be discovered during any phase of the Proposed Action, Noble shall cease operations and notify the BLM AO.

3.4.4.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts to paleontological resources under the Well Pad K2J Access Alternative would be similar to those described above for the Proposed Action Alternative. The additional 0.28 acre of surface disturbance would result in minimal impact to paleontological resources.

3.4.4.2.3 No Action Alternative

Under the No Action Alternative, neither the Proposed Action Alternative nor the Well Pad K2J Access Alternative would occur and therefore, no direct or indirect impacts to paleontological resources would result.

3.4.4.3 Cumulative Effects

The CESA for paleontological resources is the Project Area boundary (see Table 3.1-2). Cumulative effects to paleontological resources within the CESA are not anticipated because, as described above, neither the Proposed Action Alternative nor the Well Pad K2J Alternative is expected to affect paleontological resources.

3.4.5 VISUAL RESOURCES MANAGEMENT

3.4.5.1 Affected Environment

Visual resources are the visible physical features of a landscape that convey scenic value. Scenic values are classified according to the Visual Resource Management system. The objectives are to minimize the visual effects of surface disturbing activities and to maintain scenic values on public lands.

The BLM-administered lands within the Project Area are designated as Visual Resource Management system Class III and IV (see Map 3.4-2). In Class III areas, 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. Management activities can consist of major modifications and may dominate the view of the casual observer. In Class IV areas, the level of change to the characteristic landscape can be high.

The CNHT Hastings Cutoff is described in Section 3.11, National Historic Trails.

3.4.5.2 Environmental Effects

3.4.5.2.1 Proposed Action Alternative

Visual resources would be impacted by surface disturbing activities, fugitive dust, and the presence of wells throughout the Project Area. These activities would create impacts to visual resources on a localized scale including contrasts in line, form, color and texture, depending upon site-specific landscape characteristics. During the 24-hour per day drilling phase of the Proposed Action, rig lighting would also be evident at night. Lighting during construction would follow “dark sky” lighting practices. Such practices are designed to reduce the effects of artificial light on the natural environment, including sky glow, glare, light trespass, light clutter, and decreased visibility at night (International Dark-Sky Association – IDA, 2014). “Dark-sky” lighting practices implemented in the Project Area would include, but not be limited to the following:

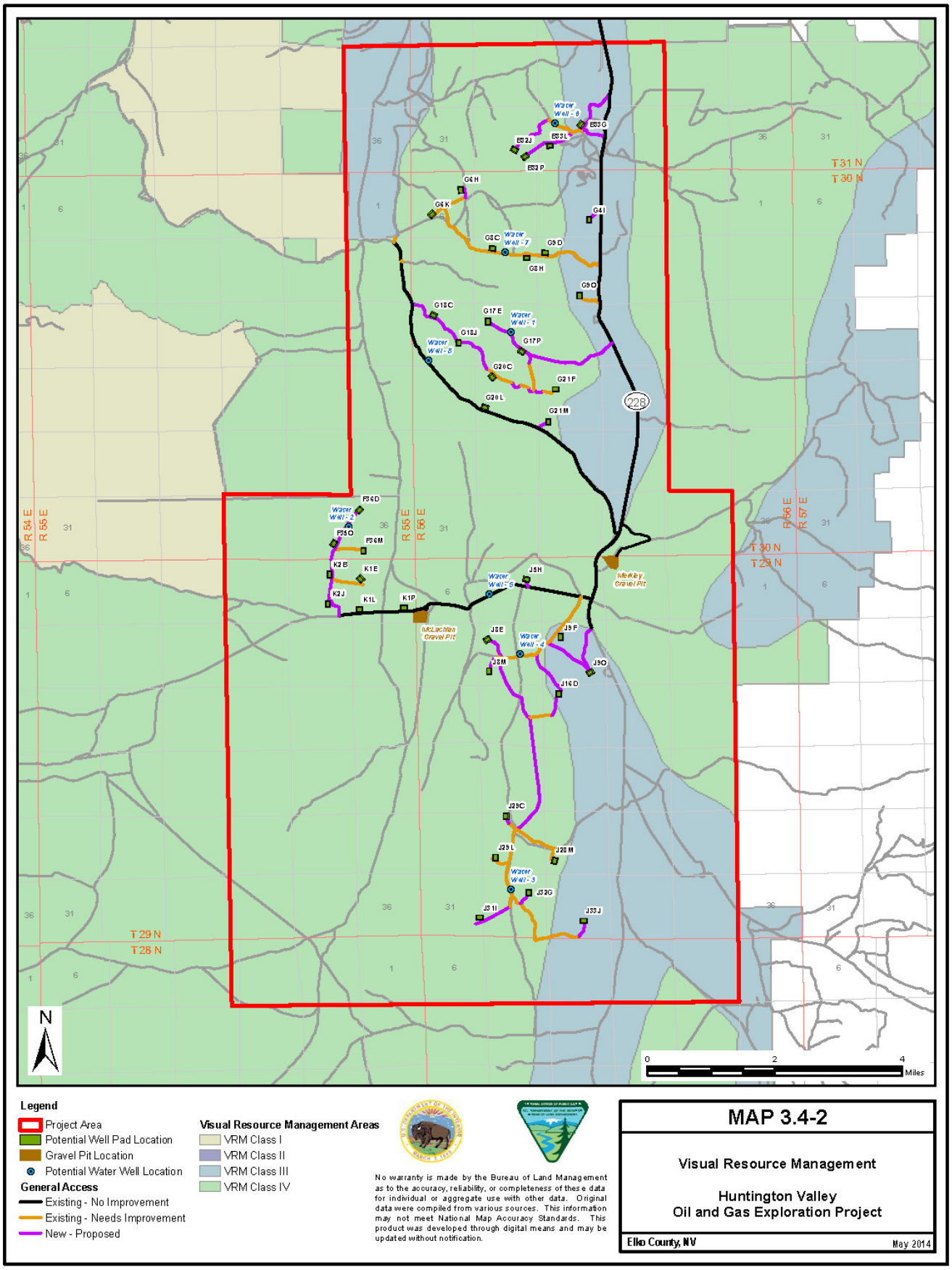
- using low glare lighting equipment;
- shielding security lighting so that the majority of light hits the target and does not cause glare;
- targeting lower lighting levels and better uniformity for safety and security lighting; and
- to the extent practical, aiming lighting on facilities from the top down, and away from adjacent areas.

Surface disturbance would be the major cause of visual resource impacts. Impacts under the Proposed Action would include well pad, gravel pit, road construction and road improvements. These features would present marked breaks and changes in the texture of the vegetation and landform patterns present. Well pad surface disturbance would impact visual line and texture elements in much the same way. Cut and fill effects from roads and well pads would also introduce distinct color and texture contrasts by exposing bare soils in areas where native vegetation and top soil comprise the existing landscape color elements.

Because of the uncertainty of exploration results, the selected 20 well pads and associated roads could occur on any combination of land ownership, and/or BLM VRM classification (VRM Class III and IV). Map 3.4-2 shows all 39 potential well pad sites, and associated road disturbance, and their relation to VRM classes on BLM-administered lands. Up to 314.1 acres would be disturbed on BLM-administered lands over the short-term (221.6 acres after interim reclamation). However, it is not likely that all 20 well pads and access roads would be constructed on BLM lands, and the acres disturbed on VRM lands could be much lower.

Noble proposes to paint all facilities or structures with earth-tone colors such as “desert tan” to reduce the visual impact. All areas slated for short-term disturbance would be re-contoured and revegetated to blend with the natural topography as soon as possible after construction, where practicable.

Project-related effects to the CNHT Hastings Cutoff are addressed in Section 3.4.2, National Historic Trails.



Legend

- Project Area
- Potential Well Pad Location
- Gravel Pit Location
- Potential Water Well Location

General Access

- Existing - No Improvement
- Existing - Needs Improvement
- New - Proposed

Visual Resource Management Areas

- VRM Class I
- VRM Class II
- VRM Class III
- VRM Class IV

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

MAP 3.4-2

Visual Resource Management

Huntington Valley
Oil and Gas Exploration Project

Elko County, NV — May 2014

Mitigation Measures

The BLM has not identified any mitigation measures in addition to those for the CNHT Hastings Cutoff (see Section 3.4.2, National Historic Trails).

3.4.5.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts to visual resources under the Well Pad K2J Access Alternative would be similar to those described above for the Proposed Action Alternative. The additional 0.28 acre would not result in additional direct or indirect impacts to the CNHT.

3.4.5.2.3 No Action Alternative

Under the No Action Alternative, there would be no impacts from the Proposed Action Alternative or the Well Pad K2J Alternative to visual resources in the Project Area.

3.4.5.3 Cumulative Effects

The CESA for visual resources is the Project Area (see Table 3.1-2). Of the 63,495 acres between 1999 and 2013, 2,680 acres have been impacted by fire, and vegetation treatments have been applied to 1,170 acres. The surface disturbance associated with the past and present actions and RFFAs (e.g., rights-of-way, pipelines, oil and gas activities, mines) is estimated to be 476 acres, and when combined with the 314 acres of surface disturbance proposed for the Project, the total is 790 acres or 1 percent of the CESA (see Table 3.4-3). A portion of SR 228 is located within the CESA. As described above, visual impacts would occur under the Proposed Action. With implementation of Project Design Features and mitigation measures, cumulative impacts to visual resources are expected to be minimal.

3.4.6 SOCIOECONOMICS

3.4.6.1 Affected Environment

The Project Area is located in the west-central portion of Elko County, which, with 17,203 square miles, is the second largest county in Nevada. Historically, the county's economy has been based on hard rock mining, intermodal transportation, gaming, cattle ranching, and federal, state, and local governments. The City of Elko is the largest city, county seat, and the regional trade center for northeastern Nevada. The Project Area is located in high desert terrain approximately 21 miles south of Elko, near the historic ranching community of Jiggs.

Population

Elko County is sparsely populated, with 3.0 persons per square mile, compared to a statewide average of 27.4 persons per square mile. Reflecting statewide trends, Elko County's population more than doubled between 1980 and 2000 (see Table 3.4-4). With 17,269 residents in 1980, the county's population increased by an average of 6.9 percent per year to total 33,530 residents in 1990. The county's growth moderated during the 1990s, and the population increased by an average of 3.1 percent per year to total 45,291 residents in 2000. Population growth stalled during the following decade, and the county's population grew by an average of 0.8 percent per year to total 48,818 in 2010. Population growth has begun to recover, and the Nevada State Demographer's Office (NSDO) projects that Elko County's population increased by an average of 3 percent per year between 2010 and 2012, to total 51,771 residents in 2012. The NSDO projects that Elko County's population will increase at an average rate of 1.1 percent per year between 2012 and 2020, to total 56,697 in 2020 (NSDO, 2013).

Table 3.4-3
Acres Affected within Project Boundary Cumulative Effects Study Area

Resources	Acres within CESA	Acres Disturbed by Fire [1] (% of CESA)	Acres of Vegetation Treatments (% of CESA) [2]	Acres of Disturbance within Cumulative Effects Study Area by Past, Present, and RFFA's [3]				Acres of Total Project Effects (% of CESA)	Total Cumulative Disturbance Acres (% of CESA)
				Case Type	Authorized & Pending	Closed	Total		
Cultural; Paleontological; Fire Management; Geology and Minerals ; Land Tenure; Recreation; Visual	63,495	2,680 (4%)	1,170 (2%)	Rights-of-Way: Pipelines, Power lines, Fiber Optic Cable, Telephone Lines, Roads, Fences, Railroad	475	0	**475**	314 [4] (0.5%)	790 (1%)
				Oil & Gas; Mines; Mineral Material Sites: Sand, Gravel, topsoil sources and pits, includes NDOT pits	0	1	**1**		

[1] Source: BLM GIS Data. Historic Fires (1999-2013).
[2] Source: BLM GIS Data. Vegetation Treatments (1999-2013).
[3] Reasonably Foreseeable Future Actions (RFFAs). Source: BLM GIS Data. Land Lines/Land Points and Mineral Material Sites data (2013). Acres are approximate and are conservative, using the total area of the project boundaries to calculate the surface disturbance rather than the areas within the boundaries actually disturbed by the specific projects.
[4] Disturbance based on 20 well pads.

Population growth in the City of Elko has tended to follow the county's growth patterns with a slight lag. The city's 1980 population of 8,758 increased by an average of 5.3 percent per year to total 14,736 in 1990. Elko's population grew to 16,708 in 2000 (an average annual growth rate of 1.3 percent) and 18,297 in 2010 (an average annual growth rate of 0.9 percent). The Census Bureau estimates that Elko had 19,386 residents in 2012, which reflects a 2.9 percent average annual growth rate between 2010 and 2012 (Census Bureau, 2013a).

Table 3.4-4
Nevada, Elko County, and City of Elko Population Estimates and Projections

Area	Population Levels			Average Annual Growth Rate		
	Nevada	Elko County	City of Elko	Nevada	Elko County	City of Elko
1980[1]	800,493	17,269	8,758	--	--	--
1990[1]	1,201,833	33,530	14,736	4.2%	6.9%	5.3%
2000[1]	1,998,257	45,291	16,708	5.2%	3.1%	1.3%
2010[1]	2,700,552	48,818	18,297	3.1%	0.8%	0.9%
2012	2,750,217[2]	51,771[2]	19,386[3]	0.9%	3.0%	2.9%
2020[2]	2,959,641	56,697	NR[4]	0.9%	1.1%	NA[4]

[1] Census Bureau, 2013b.
[2] Census Bureau, 2013a.
[3] NSDO, 2013.
[4] NR = Not Reported. The NSDO does not forecast municipal populations.

Income and Employment

Income. Personal income measures the income that individuals receive through earnings, asset ownership, and transfer receipts (*i.e.* income received for services not currently rendered). Earnings, which include proprietor, self-employment, and wage income, typically comprise a large portion of personal income, and are an especially large source of personal income in Elko County. In 2012, earnings contributed 63 percent to per capita personal income in Nevada and 77 percent in Elko County (see Table 3.4-5). Investment income (*i.e.* dividends, interest, and rent) accounted for 21 percent of personal income in Nevada and 13 percent in Elko County. Transfer receipts, which include retirement and pension benefits, disability and unemployment insurance, medical payments, and veterans' benefits accounted for 16 percent of per-capita personal income in Nevada and 10 percent in Elko County (Bureau of Economic Analysis – BEA, 2013).

Between 2000 and 2012, per capita personal income grew more rapidly in Elko County than in Nevada as a whole. During this time, per-capita personal income increased from $30,977 to $38,221 (a 23 percent increase) in Nevada and from $25,419 to $42,201 (a 66 percent increase) in Elko County (BEA, 2013).

Table 3.4-5
Per Capita Personal Income, Nevada and Elko County, 2000 and 2012[1]

Components of Per Capita Personal Income	Nevada		Elko County	
	2000	2012	2000	2012
Per Capita Personal Income	$30,977	$38,221	$25,419	$42,201
Net Earnings	$21,454	$24,101	$19,752	$32,623
Transfer Receipts	$2,959	$6,176	$1,823	$4,319
Dividends, Interest & Rent	$6,564	$7,945	$3,844	$5,259

[1] BEA, 2013.

Employment. Between 2002 and 2012, wage and salary employment in Elko County increased nearly 24 percent, from 18,410 to 22,728 (see Table 3.4-6). Reflecting national economic conditions, most of the job growth occurred before 2008; job growth averaged 513 jobs per year between 2002 and 2008 and 310 jobs per year between 2008 and 2012. Nearly 90 percent of the jobs created between 2002 and 2012 were in the Natural Resources/Mining (2,246 new jobs), Trade/Transportation/Utilities (816 new jobs), and Construction (785 new jobs) sectors. During these years, employment gains were partially offset by job losses in the Leisure and Hospitality (390 lost jobs), Government (331 lost jobs), Financial Activities (84 lost jobs), and Information (61 lost jobs) sectors (Nevada Department of Employment, Training and Rehabilitation – NDETR, 2013a).

In 2012, major sources of employment in Elko County included the Leisure and Hospitality, Trade/Transportation/Utilities, Government, and Natural Resources/Mining sectors. The county's largest employers were the Elko County School District, which covers the entire county; the Pepper Mill, Rainbow, and Nugget hotel casinos in Wendover; Montego Bay Casino Resort in West Wendover; Cactus Pete's Hotel and Casino in Jackpot; and the Jerritt Canyon Mine in Elko (NDETR, 2013b).

Table 3.4-6
Elko County Employment by Industry, 2002, 2008 and 2012[1]

Industrial Sector	2002	2008	2012
Natural Resources/Mining	1,130	2,190	3,376
Construction	820	1,250	1,605
Manufacturing	150	220	245
Trade/Transportation/Utilities	3,220	3,970	4,036
Information	210	190	149
Financial Activities	540	540	456
Professional & Business Services	850	970	1,507
Education & Health Services	970	1,300	1,370
Leisure & Hospitality	6,210	6,190	5,820
Other Services	430	660	592
Government	3,890	3,990	3,559
Total Employment by Industry	18,410	21,490	22,728

[1] NDETR, 2013a.

Annual wages in Elko County averaged $46,904 in 2012, and were highest in the Natural Resources/Mining and Professional & Business Services sectors, at $82,732 and $66,404, respectively; and lowest in the Leisure and Hospitality sector, at $23,608 (NDETR, 2013a).

Unemployment Rates. Since 2000, annual unemployment rates in Elko County have been comparable to or lower than the national unemployment rate and lower than the state's unemployment rate (see Table 3.4-7). The national unemployment rate was lowest in 2000 at 4.0 percent, Nevada's unemployment rate was lowest in 2000 and 2006 at 4.2 percent, and Elko County's unemployment rate was lowest in 2007 at 3.4 percent. Unemployment rates in all jurisdictions peaked in 2010, at 9.7 percent in the United States, 13.7 percent in Nevada, and 7.4 percent in Elko County, and have fallen since that time. Between January and November of 2013 (the most recent period for which unemployment data were available at the time this report was written), unemployment rates averaged 7.5 percent across the United States, 9.5 percent in Nevada, and 5.6 percent in Elko County (Bureau of Labor Statistics - BLS, 2014a).

Table 3.4-7
Unemployment Rates, United States, Nevada and Elko County, 2000 - 2013[1]

Year	United States	Nevada	Elko County
2000	4.0%	4.2%	3.9%
2001	4.7%	5.4%	5.0%
2002	5.8%	5.9%	4.6%
2003	6.0%	5.4%	4.6%
2004	5.5%	4.4%	3.8%
2005	5.1%	4.5%	3.9%
2006	4.6%	4.2%	3.6%
2007	4.6%	4.7%	3.4%
2008	5.8%	7.0%	4.5%
2009	9.3%	11.6%	6.5%
2010	9.7%	13.7%	7.4%
2011	8.9%	13.6%	7.1%
2012	8.1%	11.1%	5.9%
2013 (Jan – Nov)	7.5%	9.5%	5.6%

[1] BLS, 2014a.

Fiscal Conditions

Nevada county governments obtain revenues from a combination of locally derived and state shared sources. Local sources include property taxes on real and personal property and on the net proceeds of minerals located in the county. Counties also collect revenues from fines, licenses and permits, and fees for services. State-shared revenues include sales, motor vehicle, fuel, and gaming revenues.

Intergovernmental resources, primarily from state revenue sharing, are the largest source of revenue to Elko County. Between 2009 and 2013, intergovernmental resources accounted for an average of 55 percent of annual county revenues. Property taxes are the county's second largest revenue source; between 2009 and 2013 property taxes accounted for an average of 28 percent of annual county revenues. Charges for services, fines and forfeitures, licenses and permits, and miscellaneous sources provide the remainder of the county's revenues. Total revenues to Elko County government increased from $43.7 million in 2009 to $46.3 million in 2012 and were budgeted to fall to $43.7 million in 2013 (Elko County, 2011; Elko County, 2012; Elko County, 2013).

Oil and natural gas production affects a county's fiscal status largely through its impact on the ad valorem, or property, tax base. Unlike property that is subject to property tax in Nevada, and assessed at 35 percent of its taxable value, oil and gas production is assessed at 100 percent of taxable value and subject to the net proceeds of minerals tax, which ranges from 2 to 5 percent, depending on the ratio of net proceeds to gross proceeds. Because the net proceeds of minerals tax is an ad valorem tax in lieu of a production-related property tax, the county where the mineral was extracted receives revenues equal to the net proceeds multiplied by the property tax rate. Any additional amount of tax paid up to the 5 percent statutory cap goes to the state (Nevada Taxpayers Association, 2008).

Net proceeds of minerals comprise approximately 20 percent of Elko County's total assessed value, with assessed valuations for real and personal property accounting for the remainder. The total assessed valuation in Elko County increased from $1.4 billion in 2010 to $1.8 billion in

2013 (a 24 percent increase). During this time, net proceeds of minerals increased 38 percent, from $236.4 million to $325.3 million, and assessed property values increased 35 percent, from $1.2 billion to $1.6 billion (Nevada Department of Taxation — NDT, 2010, 2011, 2012, and 2013).

Housing

Most of the housing in Elko County and the City of Elko consists of owner-occupied single-family and mobile homes. According to the Census Bureau's *2008-2012 American Community Survey*, 94 percent (6,705 housing units) of the 7,147 housing units in the city of Elko were occupied. Owners occupied 65 percent of Elko's occupied housing units, renters occupied 35 percent, and the majority of vacant housing units were available for rent. Between 2008 and 2012, the median home value in Elko was $201,900, vacancy rates at rental properties averaged 4.3 percent, and monthly rents averaged $918 (Census Bureau, 2013c).

Short-term housing accommodations near the Project Area include approximately 2,030 motel rooms and 480 RV sites in Elko (TripAdvisor, 2014; RV Park Reviews, 2014). Because these estimates are based on lodging facilities with an on-line presence, they are likely to underestimate the number of short-term housing accommodations in the vicinity of the Project Area as they do not include smaller establishments and privately-let facilities that do not advertise on the internet.

Public Safety

Medical Services. Numerous physicians and other medical practitioners in Elko provide routine medical and emergency services to residents and workers in the Project Area. There are five urgent care facilities located in Elko, and Elko's Northeast Nevada Regional Hospital is the principal health care facility in northeastern Nevada. The hospital provides 24-hour emergency care, has 75 acute care rooms, a surgery department, intensive care unit, radiology and diagnostic imaging, a full service lab, and offers most major medical specialty services.

Emergency and Fire Protection Services. The Nevada Division of Forestry provides first response fire and emergency services in the Project Area. The Division of Forestry has a fire station in Spring Creek that is staffed 24-hours a day by nine paid personnel working over three shifts. The Jiggs, Spring Creek, and Ten Mile volunteer fire departments assist the Division of Forestry with fire protection, emergency services, and rescue in the Project Area. Each of these departments has approximately 15 volunteer firefighters (Urretsi, 2014). In addition, the BLM has wildland firefighting units that provide supplemental fire protection services in outlying areas of Elko County and participate in mutual aid/cooperative agreements with local fire departments. The BLM's wildland firefighting resources include Interagency Hotshot Crews who assist BLM district and field offices with fire suppression. The Elko District Office coordinates the BLM's Interagency Hotshot Crews in northeastern Nevada.

Elko County Ambulance Service has an ambulance unit stationed in Elko. The ambulance service is staffed by Elko County and includes paramedics, emergency medical technicians, and volunteers. All ambulance service is dispatched through central dispatch in Elko.

Law Enforcement. The Elko County Sheriff's Office provides law enforcement services in unincorporated communities and rural areas of Elko County. The Sheriff's Office has one sheriff, one undersheriff, two lieutenants, four sergeants, five detectives, 24 deputies, four control room technicians, one animal control officer, and 10 support personnel. Additional personnel, including one lieutenant, three sergeants and 14 deputies, are assigned to the county jail in Elko. The Sheriff's Office Spring Creek Substation provides first-call police services in the

Project Area. Four deputies are assigned to the Spring Creek Substation and one rural deputy is assigned to rural areas of southwest Elko County, including Jiggs and Ruby Valley (Pitts, 2014). The Nevada Highway Patrol provides law enforcement services on state highways and Interstate-80 in the Project Area vicinity.

3.4.6.2 Environmental Effects

3.4.6.2.1 Proposed Action Alternative

Most socioeconomic impacts, including those related to population, employment, government revenues, housing, and public safety and emergency services, would depend on the size of the workforce and the length of time construction (including drilling and completions) and operations (production of the well) would continue. Potential workforce requirements and socioeconomic impacts, especially those related to employment, income, and housing, would be greatest during the construction phase. Fiscal impacts would be greatest during the operations phase. During operations, the Proposed Action would have lower impacts on employment and income, and on-going fiscal impacts.

Population

Noble expects that non-local workers would comprise approximately 78 percent of the workforce during the Construction/Drilling Phase and between 55 and 75 percent of the workforce during the Production/Operations Phase. The workforce required for exploratory drilling is largely transitory because drilling and completion crews tend to temporarily relocate to areas where fields are being explored and are not typically accompanied by dependents. Based on anticipated production levels, the operational workforce would include approximately 19 oil truck drivers employed by crude oil transportation companies located outside of Elko County. These workers are expected to live outside Elko County and would not be likely to relocate due to the Proposed Action. Residents of Elko County are expected to comprise between 25 and 45 percent of the operational workforce (see Table 2.2-10 in Section 2.2.1.2.4). Approximately 13 water truck drivers would be required during operations if produced water is hauled away for off-site disposal, and as few as three water truck drivers would be required if produced water is disposed in an on-site injection well. Produced water truck drivers and four additional production workers (one pumper, one maintenance worker, and two truck drivers for dust control) are expected to be drawn from the existing population in the Elko vicinity. Few workers are expected to relocate to the Elko area due to operational activities associated with the Proposed Action. Therefore, neither the construction/drilling nor production/operations workforces would be expected to impact regional or local population trends.

Income and Employment

Direct employment benefits of the Proposed Action would include up to 131 temporary construction jobs and up to 36 jobs associated with year round production. In 2012, wages earned in Nevada in industries supporting the drilling of oil and gas wells averaged $1,293 per week ($67,221 per year) and wages earned by freight truck drivers averaged $904 per week, or $47,025 per year (BLS, 2014b).

The Proposed Action would also generate indirect economic benefits to local and regional businesses through the purchase of goods and services required for the Project. The demand for goods and services would be further stimulated by the Proposed Action's workforce and by employees of businesses that support the Proposed Action and its workforce. Most of these regional benefits would be likely to occur in Elko, where several regional business services are located.

Fiscal Conditions

Oil production in the Project Area would provide economic benefits to federal, state, and local governments through the generation of federal mineral lease (FML) royalties, net proceeds of mineral tax, and property tax on physical assets. Noble estimates average well production of approximately 231,000 barrels (9.7 million gallons) of oil over a well's anticipated productive life of approximately 20 years. Oil production rates are typically highest when a well is drilled and decline rapidly thereafter. The analysis of fiscal impacts assumes that average well production decreases from approximately 42,200 barrels (1.77 million gallons) in Year 1 to approximately 8,700 barrels (365,400 gallons) in Year 10 and approximately 5,200 barrels (218,400 gallons) in Year 20. These estimates are annual averages and do not imply that any single well would produce at this level in any given year. Based on 2013 monthly prices of domestic crude oil reported by the Energy Information Administration (EIA), the tax estimates below assume a price of $97.42 per barrel of oil (EIA, 2013).

FML Royalties

All of the potential well pads in the Project Area are located on federal mineral leases and are subject to an FML royalty rate of 12.5 percent on the net revenues from extracted oil. Under the assumptions noted above, average FML royalties from a single well would range from $513,889 in Year 1 to $106,437 in Year 10 and $63,172 in Year 20 (see Table 3.4-8). Fifty-one percent of these revenues would be retained by the federal government and 49 percent would be returned to the State of Nevada and distributed to stage agencies and programs, higher education, and communities impacted by mineral development.

Table 3.4-8
Estimated Average Per Well FML Royalty and
Net Proceeds of Mineral Tax Revenues, Years 1, 10 and 20

Government Revenues	Year 1	Year 10	Year 20
FML Royalties	$513,889	$106,437	$63,172
FML Royalties Returned to Nevada	$251,805	$52,154	$30,954
Net Proceeds of Minerals Tax	$125,903	$26,077	$15,477
Elko County Portion of Net Proceeds of Minerals Tax	$92,172	$19,091	$11,331
State Portion of Net Proceeds of Minerals Tax	$33,731	$6,986	$4,147

Net Proceeds of Minerals

All wells would be subject to net proceeds of minerals tax. Royalties and other deductions are subtracted from a well's gross proceeds to calculate the net proceeds on which this tax is based. Assuming an average tax rate of 3.5 percent on net proceeds, average anticipated production from a single well would generate net proceeds of minerals tax revenues from $125,903 in Year 1 to $26,077 in Year 10 and $15,477 in Year 20 (see Table 3.4-8).

Elko County would receive a portion of these revenues equal to the assessed value of production multiplied by the property tax rate. Based on a property tax rate of 2.562 percent for Fiscal Year 2013-2014, Elko County would receive between $92,172 in Year 1, $19,091 in Year 10, and $11,331 in Year 20 from a typical well. The county's portion of net proceeds of mineral tax revenues would be used to fund the Elko County government, Elko County School District, Elko Convention Visitors Authority, Elko Television Station, State Natural Resource Conservation, and statewide capital improvements (NDT, 2013).

Sales and Use Tax Revenue

The Proposed Action would generate sales and use tax revenue to Elko County through the sale of taxable goods either purchased in the county or purchased elsewhere and imported into the county. Most sales and use tax revenue would result from retail expenditures by Noble's

direct employees, its contractors, and individuals whose jobs would be supported by the Proposed Action. Sales and use tax receipts would be highest during the Construction/Drilling Phase.

Housing

The Proposed Action is not expected to have a noticeable impact on long-term housing markets in either the city of Elko or Elko County because the influx of new permanent workers is likely to be minimal and within the county's absorptive capacity. Local residential real estate markets would respond to a potential increase in the demand for housing due to the Project's permanent workforce through the construction of new housing units or the sale of existing housing units.

The construction workforce could impact Elko's short-term housing market through increased occupancy rates at some lodging establishments, but would not be likely to have a large impact on short-term housing markets across the city or county. Because drilling workers would remain on-site in temporary housing accommodations while the well is being drilled, the demand for short-term housing would peak with approximately 50 non-local construction workers. This potential peak demand corresponds to approximately 2.5 percent of the motel rooms in Elko and approximately 2 percent of the motel rooms and RV sites in Elko. There could be upward pressure on motel rates in Elko during the Construction/Drilling Phase, especially if the peak construction workforce were to coincide with the peak hunting season or special events such as the Elko Motorcycle Jamboree, National Basque Festival, or Ruby Mountain Balloon Festival in September.

Public Safety

Medical Services. Temporary workers who travel to job sites typically rely on medical service providers at home for routine medical services. However, there could be a temporary increase in the demand for local medical services, including urgent care, by health care providers in Elko. Because construction workers would be in the Project Area for relatively short periods of time, and few operational workers are expected to relocate to Elko County, the Proposed Action is not expected to have a substantial or long-term impact on medical service providers in Elko or the county.

Emergency and Fire Protection Services. Construction activities in the Project Area could result in medical emergencies that would place additional demands on the Jiggs, Spring Creek, and Ten Mile volunteer fire departments and the Elko County Ambulance Service. Implementation of Noble's fire prevention measures related to fire prevention as described in Appendix K would reduce potential demands placed on the Nevada Division of Forestry, local volunteer fire departments, and supplementary firefighting and emergency response personnel in Elko County.

Law Enforcement. During construction, the Proposed Action could increase drug-related and other offenses frequently associated with transient workforces. Enforcing the requirement that drilling workers housed on-site remain within the Project Area during the period in which a well is drilled would reduce the risks of such offenses and decrease potential demands on local law enforcement agencies.

Mitigation Measures

The BLM has not identified mitigation measures to further reduce potential socioeconomic impacts.

3.4.6.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts to Socioeconomic Resources under the Well Pad K2J Access Alternative would be the same as those described above for the Proposed Action Alternative.

3.4.6.2.3 No Action Alternative

Under the No Action Alternative, neither the Proposed Action Alternative nor the Well Pad K2J Alternative would be developed and there would be no short-term employment gains associated with construction and no long-term employment and fiscal gains associated with field production. There would be no potential impacts on community services.

3.4.6.3 Cumulative Effects

Cumulative effects to socioeconomic resources in the CESA, which is Elko County (see Table 3.1-2), include mining, oil and gas exploration, geothermal resources, other industrial development, and ongoing activities related to agriculture and tourism. These effects would continue under the No Action Alternative. As described above, the Proposed Action would provide an additional source of government revenues to the State of Nevada and Elko County. To the extent that construction overlapped with the construction or development of other projects in the region, upward pressure on motel rates and occupancies could occur. No cumulative effects of concern for socioeconomic resources have been identified under the Proposed Action and No Action Alternative.

3.4.7 ENVIRONMENTAL JUSTICE

3.4.7.1 Affected Environment

Executive Order 12898 requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations (defined as those living below the poverty level). According to the U.S. Census Bureau's *2008 – 2012 American Community Survey*, minorities, including persons of African American, American Indian, Asian, Pacific Islander, and Hispanic descent, comprise approximately 56 percent of the population in Nevada, 35 percent of the population in Elko County, 31 percent of the population in the Elko Census County Division (CCD) (where the Proposed Action is located), and 43 percent of the population in the City of Elko (see Table 3.4-9).

The South Fork Reservation is located approximately 4 miles northwest of the northern boundary of the Project Area. The South Fork Reservation is one of four colonies in Elko and Lander counties that are governed by the Te-Moak Tribe of Western Shoshone Indians. There are approximately 260 members of the Te-Moak Tribe, approximately 80 of whom live on the South Fork Reservation (Townsend, 2014). Federal contracts and cattle-raising are the primary sources of tribal income on the South Fork Reservation (Te-Moak Tribe of Western Shoshone Indians, 2014).

Between 2008 and 2012, low-income populations comprised approximately 14 percent of Nevada's population, 8 percent of Elko County's population, 5 percent of the Elko CCD's population, and 6 percent of the City of Elko's population (Census Bureau, 2013c).

Table 3.4-9
Minority Populations and Populations in Poverty

Nevada, Elko County, Elko County CCD and the City of Elko[1]	Nevada	Elko County	Elko CCD[2]	City of Elko
Minority Populations				
African American	8.2%	1.2%	0.9%	1.5%
American Indian & Alaska Native	1.1%	5.1%	4.0%	3.5%
Asian & Pacific Islander	8.0%	1.3%	1.3%	2.0%
Some Other Rate	7.4%	2.5%	2.4%	3.5%
Two or More Races	4.0%	1.5%	2.1%	2.6%
Hispanic, Any Race[3]	26.9%	23.3%	19.9%	29.8%
Total Minority	55.6%	34.8%	30.6%	42.8%
Populations in Poverty				
Median Household Income	$54,083	$70,411	$75,581	$71,297
Persons Below Poverty Level	14.2%	7.8%	5.1%	5.8%

[1] Source: Census Bureau, 2013c.
[2] CCD = Census County Division.
[3] Hispanic origin is considered an ethnicity, not a race. Hispanics may be of any race.

3.4.7.2 Environmental Effects

3.4.7.2.1 Proposed Action Alternative

Overall, Elko County, the Elko CCD, and the City of Elko contain lower portions of minority and low-income populations than the State of Nevada as a whole. Therefore, the Proposed Action would not result in disproportionately high and adverse human health or environmental impacts on minority or low income populations. The Proposed Action is not likely to have adverse impacts on the 80 members of the Te-Moak tribe living on the South Fork Reservation.

Mitigation Measures

The BLM has not identified any mitigation measures to further reduce potential impacts to environmental justice.

3.4.7.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts to Environmental Justice under the Well Pad K2J Access Alternative would be the same as those described above for the Proposed Action Alternative.

3.4.7.2.3 No Action Alternative

Under the No Action Alternative there would be no impacts on minority or low-income populations.

3.4.7.3 Cumulative Effects

The CESA for environmental justice is Elko County (see Table 3.1-2). As described above, the Proposed Action would not have an adverse effect on minority or low-income populations and would therefore not contribute to an incremental increase in cumulative effects. No cumulative effects of concern for environmental justice impacts are identified under the Proposed Action or Well Pad K2J Access Alternative.

3.4.8 TRANSPORTATION AND ACCESS

3.4.8.1 Affected Environment

Primary access to the Project Area is via Interstate-80 to Elko then south on SR 227 (Lamoille Highway), and SR 228 (Jiggs Highway). Within the Project Area, Circle L Ranch Road (CR 716)

and Smith Creek Road (CR 716A), would be used for project access. Access to the Project Area is described in Chapter 2 and detailed in the Transportation Plan (Appendix A).

Table 3.4-10 shows the NDOT average daily traffic (ADT) counts in 2012 on highways and roads in the vicinity of the Project Area. In most cases, traffic has been increasing on affected roadway segments. In addition to NDOT's reported traffic volumes, the Elko County Road Department reported a 2011 ADT of 95 vehicles on Smith Creek Road (CR 716A), between Twin Bridges and the Harry Peters Ranch, and a 2011 ADT of 45 vehicles on Circle L Ranch Road (CR 716). Traffic on these county roads fluctuates greatly over the course of a year and is highest during hunting season (September through December) (Lister, 2014).

Table 3.4-10
Average Daily Traffic on Highways and Roads
Near the Project Area, 2010, 2011 and 2012[1]

NDOT Station ID	Road	Segment	2010	2011	2012
0070016	U.S 40/State Route (SR) 535/Idaho St.	0.3 mi E of E/B off ramp of Elko West Interchange (Exit 298)	2,900	3,000	3,300
0070017	US 40/SR 535/Idaho St.	0.4 mi W of SR 225	3,400	4,300	3,800
0070196	US 40/SR 535/Idaho St.	100 feet W of 3rd Street	8,700	9,200	9,700
0070220	US 40/SR 353/Idaho St.	Idaho St., 1000 ft W of 9th St.	13,000	13,000	12,500
0075210	US 40/SR 353/Idaho St.	600 feet E of Convention Center Drive	18,000	18,300	18,300
0070186	US 40/SR 353/Idaho St.	0.1 mi E of 30th St at east Elko city limit	7,900	7,800	7,900
0070189	SR 225/5th Street	0.1 mi S of downtown Elko (Exit 301)	23,000	23,000	24,500
0070191	SR 225/5th Street	250 ft N of Ash St,	9,000	8,800	8,400
0070192	SR 225/5th Street	150 ft N of Juniper St.	7,700	8,900	7,800
0070020	SR 227/5th Street	150 feet S of Idaho St.	8,400	8,300	8,700
0070194	SR 227/5th Street	50 feet S of River St.	13,000	15,000	12,500
0071095	SR 227/5th Street	200 feet E of Carlin Court	8,000	7,900	8,300
0070319	SR 227/5th Street	200 feet E of 12th Street	21,000	21,000	23,000
0073110	SR 227	2.4 miles west of SR 228	14,800	15,100	15,800
0070052	SR 228/Jiggs Highway	150 feet S of SR 227	900	860	850
0070057	SR 228/Jiggs Highway	0.1 mi N of Wood Lane	610	410	600
--	Smith Creek Road/ County Road [CR] 716A[2]	Between Twin Bridges and Harry Peters Ranch	NA[3]	95	NA[3]
--	Circle L Ranch Road/ CR 716[2]	Unspecified location west of SR 228	NA[3]	45	NA[3]

[1] NDOT, 2013.
[2] Lister, 2014.
[3] NA = Not Available.

NDOT maintains Interstate-80 and state routes 225, 227 and 228. The City of Elko maintains US 40/SR 535 within city limits, and NDOT maintains portions of the road that are outside city limits. Elko County maintains CR 716 (Circle L Ranch Road) for approximately 0.75 mile between SR 228 and the point at which the road enters BLM-administered land. The BLM maintains the road west of this point, as well as the privately-owned Huntington Creek Bridge. Elko County does not provide winter maintenance on CR 716A (Smith Creek Road). The Transportation Plan (Appendix A) provides a detailed description of access route maintenance.

3.4.8.2 Environmental Effects

3.4.8.2.1 Proposed Action Alternative

The Proposed Action could have direct impacts on transportation in the vicinity of the Project Area by increasing traffic volumes; and have indirect impacts through increasing opportunities for vehicle collisions with wildlife, cattle, and other vehicles, and contributing to roadway deterioration and dust creation on unpaved roads. The majority of these impacts would occur in the second year, when construction traffic would be highest.

The Transportation Plan (Appendix A) describes elements of the Proposed Action that are designed to mitigate potential impacts to transportation and access. To reduce truck traffic during construction, Noble would provide on-site housing for all drilling workers. Based on the assumptions and traffic estimates described in sections 2.2.1.1.5 and 2.2.1.2.5 and the Transportation Plan, construction traffic would peak at 95 vehicle round-trips per day during the second year of the Construction/Drilling Phase. This traffic could occur if one vertical/directional well and one horizontal well were being drilled and one horizontal well was being completed simultaneously. Assuming production from 20 wells and off-site disposal of produced water, traffic during the Production/Operations Phase would peak at 36 vehicle round-trips per day. If produced water was disposed in an on-site injection well, traffic would peak at 23 vehicle round-trips per day.

Table 3.4-11 shows the estimated effects of peak project-related traffic with and without an on-site disposal/injection well. During the Construction/Drilling phase, traffic levels in Elko could increase between 1 and 5 percent on segments of US 40/SR 535 (Idaho Street), and less than 2 percent on segments of SR 225 and SR 227 as compared to 2012 traffic volumes. South of Elko, traffic on SR 227 between the city limits and SR 228 junction could increase approximately 1 percent, and traffic on SR 228 between the SR 227 junction and Jiggs could increase between 20 and 28 percent compared to 2012 traffic levels. Peak construction traffic could result in traffic increases of 176 percent on Smith Creek Road (CR 716A) and 373 percent on Circle L Ranch Road (CR 716) compared to 2011 traffic levels. Typical traffic impacts during construction are likely to be lower than estimated peak impacts, depending on whether horizontal wells are drilled, the number of construction activities taking place, and the extent of each activity being conducted. Traffic during the Construction/Drilling phase would be temporary and would end following completion of the final well.

Table 3.4-11
Estimated Traffic Increases on Highways and Roads near the Project Area[1]

Highway/ Road	Road Segment	Construction	Operations	
			Off-Site Produced Water Disposal	On-Site Injection Well
US 40/SR 535/Idaho St	0.3 mi E of E/B off ramp- Exit 298	5.1%	2.2%	1.4%
US 40/SR 535/Idaho St	0.4 mi W of SR 225	4.4%	1.9%	1.2%
US 40/SR 535/Idaho St	100 feet W of 3rd Street	1.7%	0.7%	0.5%
US 40/SR 535/Idaho St	1000 ft W of 9th Street	1.3%	0.6%	0.4%
US 40/SR 535/Idaho St	600 feet E of Convention Center Drive	0.9%	0.4%	0.3%
US 40/SR 535/Idaho St	0.1 mi E of 30th St at east Elko city limit	2.1%	0.9%	0.6%
SR 225/5th St	0.1 mi S of downtown Elko- Exit 301	0.7%	0.3%	0.2%
SR 225/5th St	250 ft N of Ash Street	2.0%	0.8%	0.5%
SR 225/5th St	150 ft N of Juniper Street	2.1%	0.9%	0.6%
SR 227/5th St.	150 feet S of Idaho Street	1.9%	0.8%	0.5%
SR 227/5th St.	50 feet S of River Street	1.3%	0.6%	0.4%
SR 227/5th St.	200 feet E of Carlin Court	2.0%	0.9%	0.6%
SR 227/5th St.	200 feet E of 12th Street	0.7%	0.3%	0.2%
SR 227	2.4 miles west of SR 228	1.1%	0.5%	0.3%
SR 228	150 feet S of SR 227	19.7%	8.4%	5.4%
SR 228	0.1 mi N of Wood Lane	27.9%	11.9%	7.7%
Smith Creek Road/CR 716A	Between Twin Bridges & Harry Peters Ranch	176.4%	26.3%[2]	18.3%[2]
Circle L Ranch Road/ CR 716	Unspecified location west of SR 228	372.5%	83.7%[3]	55.6%[3]

[1] Based on 2012 traffic levels and assume access to 20 wells.
[2] Based on 2011 traffic levels and assume that CR 716A (Smith Creek Road) provides access to six producing wells.
[3] Based on 2011 traffic levels and assume that ten producing wells are accessed travelling west on CR 716 (Circle L Ranch Road).

Potential traffic impacts during the Production/Operations phase would depend largely on well production and location of produced water disposal. Operational traffic would peak in the early years of field production and decrease with declining well production over time. With off-site disposal, peak production traffic could result in traffic increases 2 percent or lower on US 40/SR 535 in Elko and less than 1 percent on SR 225 and 227 as compared to 2012 traffic levels. Peak production traffic could result in traffic increases on SR 228 that would be 8 to 12 percent above 2012 traffic levels, and traffic increases on Smith Creek and Circle L Ranch roads that would be 26 percent and 84 percent above these roads' respective 2011 traffic levels.

With on-site produced water disposal, peak production traffic would result in traffic increases of less than 1 percent on US 40/SR 535, SR 225 and SR 227, and between 5 and 8 percent on SR 228 as compared to 2012 traffic levels. Peak production traffic could result in traffic increases of 18 percent on Smith Creek Road and 56 percent on Circle L Ranch Road above 2011 traffic levels.

Mitigation Measures

In addition to the project design features (see Section 2.2.1.6), the BLM has not identified any measures to further mitigate impacts to transportation and access under the Proposed Action.

3.4.8.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts to the Transportation under the Well Pad K2J Access Alternative would be similar to those described above for the Proposed Action Alternative. The additional 0.28 acre of road disturbance would result in minimal impacts to Transportation Resources.

3.4.8.2.3 No Action Alternative

Under the No Action Alternative, no impacts to transportation from construction and operations of either the Proposed Action Alternative or the Well Pad K2J Access Alternative would occur.

3.4.8.3 Cumulative Effects

The CESA for transportation and access is Elko County (see Table 3.1-2). Cumulative effects that could affect transportation resources include past, current, and reasonably foreseeable future mineral, energy, and other industrial development in the CESA, which includes Elko County. These effects would continue under the No Action Alternative. As described above, the Proposed Action would have potential impacts to roadways in the CESA. With mitigation, such as dust control, adherence to speed limits, and compliance with measures included in the Transportation Plan, cumulative effects to transportation within the CESA would be minimal.

3.4.9 WASTES (HAZARDOUS OR SOLID)

3.4.9.1 Affected Environment

Hazardous and solid wastes are not a part of the natural environment. However, they could be introduced into the environment as a result of implementation of the Proposed Action, as described below.

3.4.9.2 Environmental Effects

3.4.9.2.1 Proposed Action Alternative

BLM IM WO-93-344 and CO-97-023 require that all NEPA documents list and describe any hazardous and/or extremely hazardous materials that would be produced, used, stored, transported, or disposed as a result of a proposed project.

A variety of wastes would be generated during drilling, well completion, and post-completion operations. Hazardous materials would also be used on site. These wastes and hazardous materials are described below.

Drill Cuttings. During drilling operations, drill cuttings from the well bore (mainly shale, sand, and miscellaneous rock minerals) and drilling fluids (mud) would be generated. Drilling muds may contain small concentrations of a variety of contaminants, including mercury, cadmium, arsenic, and hydrocarbons, which could adversely affect soil and water resources if released into the environment. Drill cuttings from each well bore are exempt from regulation under Subtitle C of RCRA but are still subject to other portions of the Rule. Prior to burial and/or incorporation, composite samples per 100 cubic yards of cuttings will be collected and analyzed for BTEX, total petroleum hydrocarbons (GRO/DRO), electrical conductivity, sodium adsorption ratio, pH, polycyclic aromatic hydrocarbons, and metals (arsenic, barium, cadmium, chromium (III), chromium (VI), copper, lead, mercury, nickel, selenium, silver, zinc). The results of the analysis would be compared to NDEP soil cleanup standards to determine whether the cuttings can be buried/reincorporated or if further remediation and/or off-site disposal is warranted. Sampling would include potentially acid generating materials. If concentrations exceed NDEP soil cleanup standards and/or background concentrations the cuttings will be transported to an approved waste disposal facility (Clean Harbors located between Wendover, Nevada and Salt Lake City, Utah).

Water from Hydraulic Fracturing. During well completion, the typical method used for stimulating the formation to enhance the production of oil and gas consists of hydraulic fracture treatment of the reservoir. Water used during hydraulic fracturing could adversely affect soil and water resources if released to the environment; however, excess water would be stored in temporary tanks (closed loop system) prior to reuse or disposal. Any non-recycled drilling fluids would be land-farmed with the drill cutting or disposed of at Clean Harbors.

Hazardous Materials. A variety of materials typical of oil and gas development could be at the site during construction and operations including lubricants, diesel fuel, gasoline, solvents, and hydraulic fluids. Hazardous materials which may be found at the site may include drilling mud and cementing products that are primarily inhalation hazards and materials that may be necessary for well completion/stimulation such as flammable or combustible substances and acids/gels (corrosives). Hazardous materials stored on site could adversely affect soil and water resources if released to the environment; however, no hazardous substances or wastes would be stored on the location after completion of a well. All hazardous substances brought to the location would have a Material Safety Data Sheet (MSDS) and would be properly handled so as to not cause harm to the environment or people.

Other Solid Wastes. Other solid wastes associated with drilling and well completion would include human waste and trash. Portable, self-contained chemical toilets at worksites would be used for human waste disposal. Sewage and gray water from the temporary on-site crew quarters would be stored in three 4,000 gallon domestic wastewater holding tanks sited near the modular buildings on the well pad. Portable toilet and domestic wastewater holding tanks would be pumped and the contents hauled away for disposal at an approved sewage disposal facility on a timely basis. All garbage and non-flammable waste material would be disposed of at an approved, off-site facility. Other solid waste could adversely affect soil and water resources if released to the environment.

Produced Fluids. Produced water and oil would be stored on-site in tanks until it would be removed by truck. Produced water is typically high in salinity and typically contains some petroleum hydrocarbons and BTEX (benzene, toluene, ethyl benzene, and xylene) constituents. The aboveground tanks would remain on site for the life of the well(s). Long-term, undetected

leaks from tank batteries are a potential source of groundwater contamination. Corrosion of steel tanks over the long term is quite likely. The high salt content of the produced water could very likely contribute to this process. Potential releases of produced water could occur from tanking, piping, and transport trucks. This could be the result of an accident, or tank/piping failure; however, all tanks and processing equipment would be surrounded by secondary containment adequate to retain at least 110 percent of the volume of the largest vessel with sufficient freeboard/storage for precipitation in the event of a release.

Surface waters could be negatively impacted by spills of produced water or oil, or hazardous materials stored at the pad. In cases where petroleum hydrocarbon or BTEX concentrations in contaminated soil are above regulatory limits, soil would be removed and disposed of at an approved facility. There is also the potential for diesel fuel spills from ruptured fuel tanks. Diesel spills generally require removal of contaminated soils. All spills would be quickly cleaned up and if they are greater than the reportable quantity, would be reported to NDEP and NRC, as required by law. Prompt response is necessary in the case of diesel or produced water spills in order to minimize negative impacts to surface/groundwater, plant and wildlife resources. With incorporation of design features and effective response (implementation of a Spill Prevention Plan), direct, indirect impacts from wastes would be expected to be minimal.

Mitigation Measures

In addition to the project design features (see Section 2.2.1.6), the BLM has not identified mitigation measures to further reduce potential impacts from wastes.

3.4.9.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts from Wastes under the Well Pad K2J Access Alternative would be the same as those described above for the Proposed Action Alternative.

3.4.9.2.3 No Action Alternative

Under the No Action Alternative, there would be no impacts associated with hazardous or solid wastes from either the Proposed Action Alternative or the Well Pad K2J Access Alternative.

3.4.9.3 Cumulative Effects

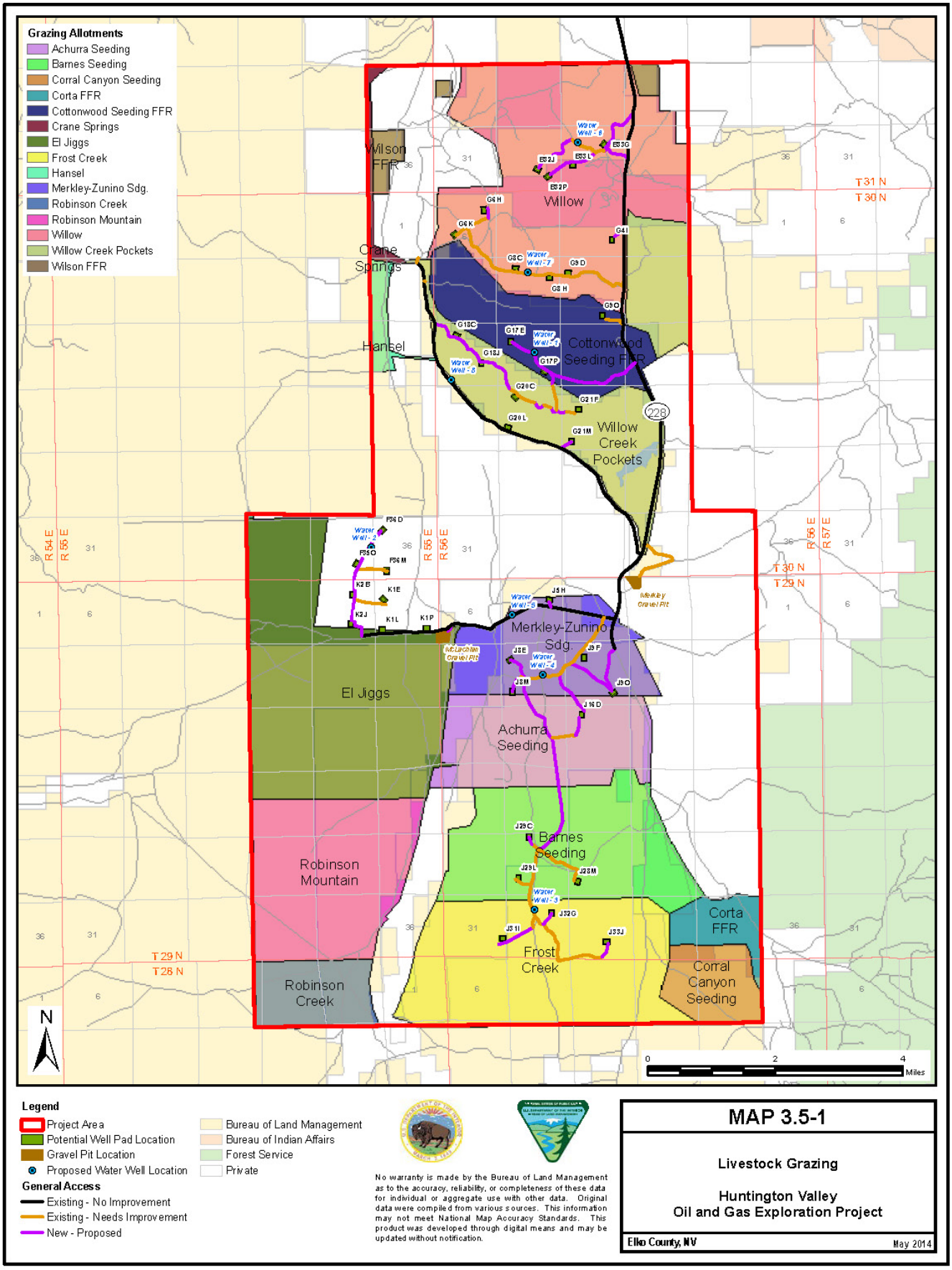
The CESA for wastes is Elko County (see Table 3.1-2). Through implementation of industry best management practices (i.e., proper disposal of drill cuttings, produced water, solid wastes, etc.) and a Spill Plan, cumulative effects in the CESA (i.e., the project boundary) are not anticipated from the Proposed Action. Therefore, cumulative effects would not occur.

3.5 LAND RESOURCES

3.5.1 LIVESTOCK GRAZING/RANGELAND HEALTH

3.5.1.1 Affected Environment

There are 15 BLM grazing allotments that coincide with the Project Area (see Map 3.5-1), of which approximately 32,225 acres of public lands are on allotments within the Project Area. Some of the allotment boundaries include private lands, but these are not factored into the public land acres or animal unit months (AUMs). Table 3.5-1 summarizes the period of use, AUMs, and size of the allotments. Currently, the allotments are permitted to graze cattle.



Legend

- Project Area
- Potential Well Pad Location
- Gravel Pit Location
- Proposed Water Well Location

General Access

- Existing - No Improvement
- Existing - Needs Improvement
- New - Proposed

- Bureau of Land Management
- Bureau of Indian Affairs
- Forest Service
- Private

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MAP 3.5-1

Livestock Grazing

Huntington Valley
Oil and Gas Exploration Project

Elko County, NV — May 2014

Table 3.5-1
Grazing Allotments Coinciding with the Project Area

Allotment	Total Allotment Public Acreage	Active Animal Unit Months	Period of Use[1]	Allotment Public Acreage in Project Area
Crane Springs	21,691	1,276	4/15-10/15	24
El Jiggs	46,716	5,597	4/1-11/15	4,598
Willow	5,238	546	4/10-10/1	4,508
Wilson FFR	1,398	188	5/1-8/10	362
Willow Creek Pockets	6,684	678	4/15-9/15	3,895
Cottonwood Seeding FFR	62	2	4/24-6/24	60
Hansel	7,781	1,553	4/10-11/30	267
Merkley-Zunino Seeding	1,950	137	4/15-10/31	1,961
Achurra Seeding	2,529	757	4/16-10/31	2,490
Barnes Seeding	3,932	342	4/16-10/30	3,345
Robinson Mountain	18,661	2,999	4/15-11/4	3,612
Corta FFR	60	92	4/20-6/20	25
Frost Creek	10,613	1,967	4/1-12/15	4,919
Corral Canyon Seeding	2,059	542	4/15-10/12	956
Robinson Creek	17,263	2,694	4/15-11/1	1,203
Totals	**146,637**	**19,370**		**32,225**

[1] Several of these allotments contain pastures through which cattle are rotated within this season of use.

3.5.1.2 Environmental Effects

3.5.1.2.1 Proposed Action Alternative

The Proposed Action would take place during a period when cattle are expected to be present on the grazing allotments. Increased vehicle traffic could raise the risk of injury or death to grazing cattle in the area, and potentially startle and scatter livestock. As noted in the Proposed Action, Noble has included design features to reduce traffic (such as workers living on-site during drilling) and to limit driving speeds to 20 mph.

A potential maximum of 262.5 acres of surface land within grazing allotments is identified for construction of 20 well pads and associated roads (Table 3.5-2). It is currently unknown how many of the 20 well pads would be on BLM-administered lands; therefore, actual impact to grazing allotments on BLM-administered lands could be much less than 262.5 acres. After interim reclamation, approximately 221.6 acres would remain disturbed throughout the production phase of the project (based on 20 well pads constructed and the maximum number of roads).

The effects on forage grasses and other herbaceous vegetation in these areas are expected to last for at least two growing seasons after reclamation of areas of surface disturbance. This timeframe assumes normal climate conditions, proper seedbed preparation, animal activity, and prevention of other factors that may impair seedling establishment. These newly reclaimed and seeded areas could produce attractive forage for livestock, which could in turn prevent timely and effective reclamation if they are over-grazed.

Table 3.5-2
Potential Maximum Disturbance from Construction
of 39 Well Pads and Associated Roads within Grazing Allotments

Grazing Allotment	Acres	Active Animal Unit Months[1]
Barnes	32.6	3
Cottonwood FFR	19.0	2
Dixie Creek	3.5	<1
Frost Creek	31.2	3
Merkley Seeding	74.1	7
Willow	101.1	10
Willow Creek Pockets	1.2	<1
Total	**262.7**	**25**

[1] AUMs calculated by estimating one AUM per 10 acres.

Well pads, which could be as large as 6.0 acres, would not be completely fenced off to cattle. Certain areas (equipment, structures, etc.) of well pads could be fenced to protect cattle and workers, determined on a case-by-case basis based upon consultation with permittees and the BLM Range Management Specialist. Estimating an average of one AUM per 10 acres, it is likely that the proposed surface disturbance would not warrant adjustments or reductions in permitted use on grazing allotments. Springs and seeps supporting wildlife and grazing stock should not be impacted by the Project because construction and activities would avoid these features by 400 feet.

Existing water supply wells are not expected to be impacted by hydraulic fracturing associated with the Proposed Action (see Section 3.2.4, Hydrology).

Mitigation Measures

The BLM has identified the following mitigation measures in addition to the Project Design Features (see Section 2.2.1.6) to further reduce effects to livestock grazing:

- The BLM Rangeland Specialist and allotment permittees shall be consulted to communicate timing and locations of activities.
- Gates used for access shall be closed immediately after passing through them.
- Fences and/or gates that are replaced shall meet BLM standards.

3.5.1.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts to the Livestock Grazing under the Well Pad K2J Access Alternative would be the same as those described above for the Proposed Action Alternative.

3.5.1.2.3 No Action Alternative

Under the No Action Alternative, impacts to grazing and rangeland resources from the Proposed Action Alternative or the Well Pad K2J Alternative would not occur within the Project Area.

3.5.1.3 Cumulative Effects

The CESA for livestock grazing/rangeland health encompasses 186,685 acres (see Table 3.1-2 and Map 3.1-7). Between 1999 and 2013, 76,803 acres (or 41 percent) within the CESA have been impacted by fire, and various vegetation treatments have been applied to 52,256 acres (or 28 percent) (see Table 3.5-3). The surface disturbance associated with the past and present actions and RFFAs (e.g., rights-of-way, pipelines, oil and gas activities, mines) is estimated to be 591 acres, and when combined with the 263 acres of surface disturbance proposed for the Project within allotments, the total is 854 acres or 0.5 percent of the CESA (see Table 3.5-3). A small portion of SR 228 is located within the CESA (see Map 3.1-7).

Table 3.5-3
Acres Affected within Grazing Allotment Cumulative Effects Study Area

Acres within CESA	Acres Disturbed by Fire [1] (% of CESA)	Acres of Vegetation Treatments [2] (% of CESA)	Acres of Disturbance within Cumulative Effects Study Area by Past, Present, and RFFA's [3]				Project Effects (Total Acres in Project Area)	Total Cumulative Disturbance Acres (% of CESA)
			Case Type	Authorized & Pending	Closed	Total		
186,685	76,803 (41%)	52,256 (28%)	Rights-of-Way: Pipelines, Power lines, Fiber Optic Cable, Telephone Lines, Roads, Fences, Railroad	400	21	**421**	263 (32,225)	854 (0.5%)
			Oil & Gas; Mines; Mineral Material Sites: Sand, Gravel, topsoil sources and pits, includes NDOT pits	120	50	**170**		

[1] Source: BLM GIS Data. Historic Fires (1999-2013).
[2] Source: BLM GIS Data. Vegetation Treatments (1999-2013).
[3] Reasonably Foreseeable Future Actions (RFFA). Source: BLM GIS Data. Land Lines/Land Points and Mineral Material Sites data (2013). Acres are approximate and are conservative, using the total area of the project boundaries to calculate the surface disturbance rather than the areas within the boundaries actually disturbed by the specific projects.

Cumulative effects to livestock grazing and rangeland health within the CESA include: wildland fire, oil and gas exploration, recreation in the Bishop Creek Dam area, dispersed recreation (i.e., hunting, camping, etc.), and OHV use (see Table 3.5-3). These effects would continue under the No Action Alternative. As described above, the Project would have an effect on grazing; however, with implementation of mitigation measures, cumulative effects to grazing are expected to be minimal under the Proposed Action.

3.5.2 RECREATION

3.5.2.1 Affected Environment

The Zunino/Jiggs Reservoir Recreation Area and campground is within the northern portion of Project Area. The reservoir remains accessible during winter months due to its close proximity to paved SR 228. During drought years, the reservoir may dry up. The nearby Ruby Range is an active area for fishing, mountain biking, hiking, hunting, skiing, snowmobiling, horse packing, and wildlife viewing. SR 228 also serves as a popular access point for the Humboldt National Forest and the Ruby Lakes National Wildlife Refuge.

3.5.2.2 Environmental Effects

3.5.2.2.1 Proposed Action Alternative

The Proposed Action may coincide with hunting seasons during the Project's multi-year construction period. Hunter access to the area would not be restricted. It is likely that hunters would choose to temporarily avoid the area where drilling would be occurring because these activities could startle and displace game, and generally impede the sport of hunting. The construction and improvement of roads in the Project Area would likely increase access for OHV users. Increased traffic, noise, and dust caused by construction could impact the dispersed recreation activities of some visitors; however, dust suppression measures would be implemented. Area roads and access to the Zunino/Jiggs Reservoir Recreation Area would remain open during all phases of the Proposed Action.

Mitigation Measures

In addition to the Project Design Features (see Section 2.2.1.6), the BLM has not identified additional mitigation measures to further reduce potential impact to recreation resources in the Project Area:

3.5.2.2.1 Well Pad K2J Access Alternative

Direct and indirect impacts to the Recreation Resources under the Well Pad K2J Access Alternative would be the same as those described above for the Proposed Action Alternative.

3.5.2.2.2 No Action Alternative

Under the No Action Alternative, there would be no impacts from the Proposed Action Alternative or the Well Pad K2J Access Alternative to recreation resources in the Project Area.

3.5.2.3 Cumulative Effects

The CESA for recreation is the Project Area (see Table 3.1-2). Of the 63,495 acres disturbed between 1999 and 2013, 2,680 acres have been impacted by fire, and vegetation treatments have been applied to 1,170 acres. The surface disturbance associated with the past and present actions and RFFAs (e.g., rights-of-way, pipelines, oil and gas activities, mines) is estimated to be 476 acres, and when combined with the 314 acres of surface disturbance proposed for the Project, the total is 790 acres or 1 percent of the CESA (see Table 3.4-3). A portion of SR 228 is located within the CESA.

Cumulative effects to recreation resources (i.e., hunting, camping, OHV use) within the CESA include: wildland fire, oil and gas exploration, and grazing. These effects would continue under the No Action Alternative. As described above, the Proposed Action Alternative and the Well Pad K2J Access Alternative may have short-term temporary effects on recreation during construction; therefore, cumulative effects are expected to be minimal.

3.5.3 WILDERNESS STUDY AREAS AND LANDS WITH WILDERNESS CHARACTERISTICS

3.5.3.1 Affected Environment

3.5.3.1.1 Wilderness Study Areas

Two Wilderness Study Areas (WSAs) border the Project Area on its west boundary (see Map 3.5-2). The Red Springs WSA contains 7,847 acres and borders the Project Area's northwest corner for approximately 2.25 miles. The 10,009-acre Cedar Ridge WSA borders the Project Area's west side for about 1.5 miles.

3.5.3.1.1 Lands with Wilderness Characteristics

Authority for conducting wilderness characteristics inventories on BLM-administered lands are found under Section 201 of the FLPMA. Guidance for conducting inventories can be found in BLM Manual 6310 (BLM, 2012d). In Manual 6310, guidance on maintaining the inventory, the wilderness characteristics inventory process, and how to analyze wilderness characteristics is provided along with forms to complete when conducting the inventories.

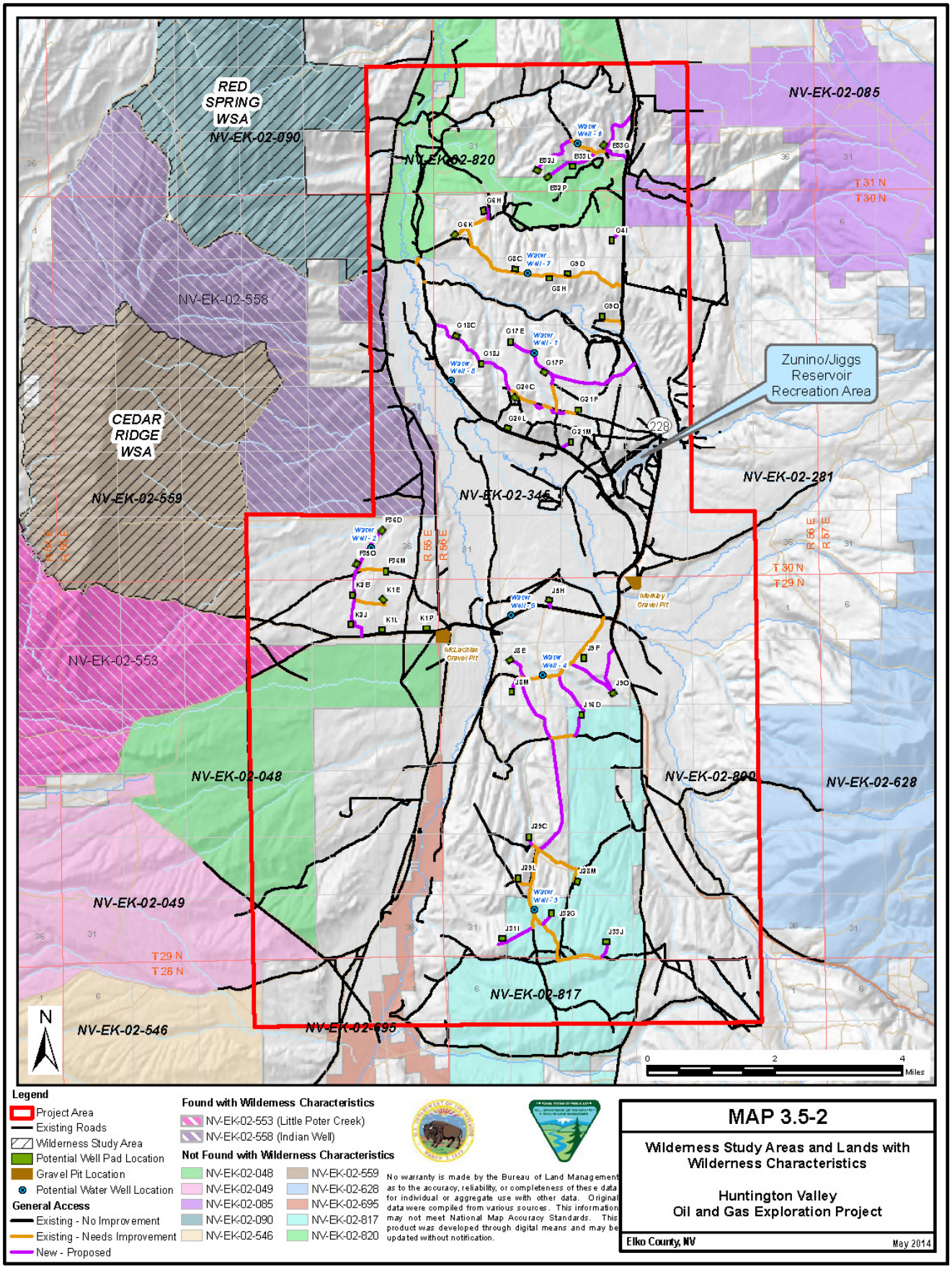
The BLM Tuscarora Field Office has completed inventories around and within the Project Area for lands with wilderness characteristics. BLM identified six polygons that lay within the Project Area. Of the six polygons inventoried, two of the polygons were determined to possess wilderness characteristics: Indian Well (NV-EK-02-558) contains about 10,116 acres abutting the south side of the Red Spring WSA (see Map 3.5-2) and has approximately 1,441 acres within the Project Area; and Little Porter Creek (NV-EK-02-553) has 15,422 acres, of which approximately 181 acres fall within the Project's western boundary.

The four other polygons within the Project Area were determined not to possess wilderness characteristics. They are Rose Well (NV-EK-02-048), Robinson Creek (NV-EK-02-049), Diamond Hills (NV-EK-02-546), and Huntington (NV-EK-02-817).

3.5.3.2 Environmental Effects

3.5.3.2.1 Proposed Action Alternative

The Red Springs and Cedar Ridge WSAs border the Project Area along the northwest boundary for approximately 3.75 miles. No Project activities would occur within either WSA and as identified in the Programmatic EA for the December 2005 Oil & Gas Lease Sale (BLM, 2005), new fluid mineral leases would not be issued within 0.25 mile of WSA boundaries. Project activities would not occur in the areas identified with wilderness characteristics (i.e., Indian Well and Little Porter Creek). Potential visual effects are addressed in Section 3.4.5.



Legend

- Project Area
- Existing Roads
- Wilderness Study Area
- Potential Well Pad Location
- Gravel Pit Location
- Potential Water Well Location

General Access

- Existing - No Improvement
- Existing - Needs Improvement
- New - Proposed

Found with Wilderness Characteristics

- NV-EK-02-553 (Little Poter Creek)
- NV-EK-02-558 (Indian Well)

Not Found with Wilderness Characteristics

- NV-EK-02-048
- NV-EK-02-049
- NV-EK-02-085
- NV-EK-02-090
- NV-EK-02-546
- NV-EK-02-559
- NV-EK-02-628
- NV-EK-02-695
- NV-EK-02-817
- NV-EK-02-820

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MAP 3.5-2

Wilderness Study Areas and Lands with Wilderness Characteristics

Huntington Valley Oil and Gas Exploration Project

Elko County, NV — May 2014

Mitigation Measures

In addition to the Project Design Features (see Section 2.2.1.6), the BLM has identified the following mitigation measures to further reduce potential effects to adjacent Wilderness Study Areas:

- No vehicles shall be allowed in the Red Springs or Cedar Ridge Wilderness Study Areas. Noble shall utilize all appropriate means to inform project personnel of the Wilderness Study Area boundaries and the limitations.
- If infringement upon the Wilderness Study Areas occurs, Noble shall immediately contact the BLM project lead with a description of the occurrence and report to the BLM Authorized Officer concerning the status and activities of the project and compliance with these measures.

3.5.3.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts to the Wilderness Study Areas and Lands with Wilderness Characteristics under the Well Pad K2J Access Alternative would be the same as those described above for the Proposed Action Alternative.

3.5.3.2.3 No Action Alternative

Under the No Action Alternative, there would be no effects from the Proposed Action Alternative or the Well Pad K2J Access Alternative to WSAs or lands with wilderness characteristic resources in the Project Area.

3.5.3.3 Cumulative Effects

The CESA for Wilderness Study Areas is 267,607 acres (see Table 3.1-2 and Map 3.1-3). Within the CESA between 1999 and 2013, 82,177 acres have been impacted by fire and vegetation treatments have been applied to 52,183 acres. Emigrant Mine is located approximately 8 miles to the northwest of the Red Spring WSA, and Railroad Mine is located approximately 9 miles to the west of the Red Spring WSA. The Cedar Ridge Well is approximately 1 mile from the southwest corner of the Cedar Ridge WSA. Neither the Proposed Action Alternative nor the Well Pad K2J Alternative would result in direct effects to either WSA; therefore, cumulative effects would not occur.

3.5.4 LAND TENURE, RIGHTS OF WAY AND OTHER USES

3.5.4.1 Affected Environment

Table 3.5-4 lists the rights-of-way for roads, utilities, and communication sites that occur within the Project Area.

In 2005, the BLM amended the Elko RMP with a Programmatic EA for the December 2005 Oil and Gas Lease Sale (BLM, 2005) which guides the issuance of future leases in the Project Area. Stipulations were recommended for future leases to protect a variety of other resource issues (i.e. wildlife, recreation, etc.). Table 2.2-2 (above) lists the federal oil and gas leases within the Project Area and the stipulations that apply.

Table 3.5-4
Authorized or Pending Rights-of-Way within the Project Area[1]

Serial Number	Owner	Case Type
NVCC0004592	Owen Arnot	Irrigation Facility
NVN002111	Wells Rural Electric	Power Transmission Line
NVN010911	Wells Rural Electric	Power Transmission Line
NVN015715	Wells Rural Electric	Power Transmission Line
NVN019958	Citizens Comm	Telephone Line
NVN034915	Wells Rural Electric	Power Transmission Line
NVN037292	NV Dept. of Wildlife	Zunino Aeration Pipeline
NVN039144	Forest Service	Road
NVN043322	Wells Rural Electric	Power Transmission Line
NVN046530	Elko County	Road
NVN046531	Elko County	Road
NVN046532	Elko County	Road
NVN046533	Elko County	Road
NVN046534	Elko County	Road
NVN081091	Paris Pete Trust	Road
NVN088373	Citizens Comm	Power Transmission Line
NVN005117	NV Dept. of Transportation	Highway
NVN005233	NV Dept. of Transportation	Material Site/Jiggs Zunino Pit

[1] BLM, 2014.

3.5.4.2 Environmental Effects

3.5.4.2.1 Proposed Action Alternative

Separate rights-of-way grants and possibly temporary use permits would be required for off-lease road construction. Existing main roads used for access that are substantially damaged by the Proposed Action would be restored to conditions existing prior to the Proposed Action. Existing grant holders could be impacted by the Proposed Action but would be minimized by use agreements with existing rights-of-way holders, authorized users, and any transmission line operators prior to disturbance.

Mitigation Measures

The BLM has identified the following mitigation measure to further reduce potential impacts to existing right-of-way holders.

- Agreements allowing construction and maintenance shall be obtained with all existing right-of-way holders, authorized users, and pipeline/transmission line operators prior to surface disturbance or construction of locations or access across or adjacent to any existing or approved rights-of-way or pipelines.

3.5.4.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts to the rights-of-way, land uses, or other facilities under the Well Pad K2J Access Alternative would be similar to those described above for the Proposed Action Alternative.

3.5.4.2.3 No Action Alternative

Under the No Action Alternative, there would be no impacts from the Proposed Action Alternative or the Well Pad K2J Alternative to land uses, rights of way, or other facilities in the Project Area.

3.5.4.3 Cumulative Effects

The CESA for land tenure is the Project Area (see Table 3.1-2). Of the 63,495 acres disturbed between 1999 and 2013, 2,680 acres have been impacted by fire, and vegetation treatments

have been applied to 1,170 acres. The surface disturbance associated with the past and present actions and RFFAs (e.g., rights-of-way, pipelines, oil and gas activities, mines) is estimated to be 476 acres, and when combined with the 314 acres of surface disturbance proposed for the Project, the total is 790 acres or 1 percent of the CESA (see Table 3.4-3). A portion of SR 228 is located within the CESA.

Cumulative effects would occur as continued development in the area for rights-of-way and other uses is expected in the future. These effects would continue under the No Action Alternative. The Project would affect land tenure by construction and upgrading of roads and requirement of new rights-of-ways; however, with implementation of design features and mitigation discussed above, cumulative effects resulting from the Proposed Action Alternative or the Well Pad K2J Access alternative would not be substantial.

3.5.5 FIRE MANAGEMENT

3.5.5.1 Affected Environment

Wildfire is an important issue on public and private lands in the Project Area. The BLM Elko District Office is considered to be one of the highest fire load district offices within the BLM nationwide. In 2003, the BLM Elko District Office prepared an amendment to the 1987 Elko RMP for fire management, providing an integrated approach for response to wildfires, rehabilitating burned areas, and reducing hazardous fuel loads (BLM, 2003). Fires in the sagebrush ecosystem have created opportunities for invasive species to change the vegetation type to cheatgrass or other species which can burn rapidly and spread at a high rate.

Approximately 75 percent of Elko County is considered to be at high threat levels for the occurrence of large wildland fires (Wildland Fire Associates, 2008). This assessment is based on the vegetation types present, climate, and topography; as well as proximity to agricultural communities, wildlife habitat, and the number of large-scale historic fires within Elko County. Over 20 years, dozens of fires have burned within a 30-mile radius of the Project Area, some within the Project Area (see Map 3.5-3). The fires ranged in size from less than 50 acres to more than 190,000 acres (BLM, 2012e). Within the Project Area, 3,171 acres have been affected.

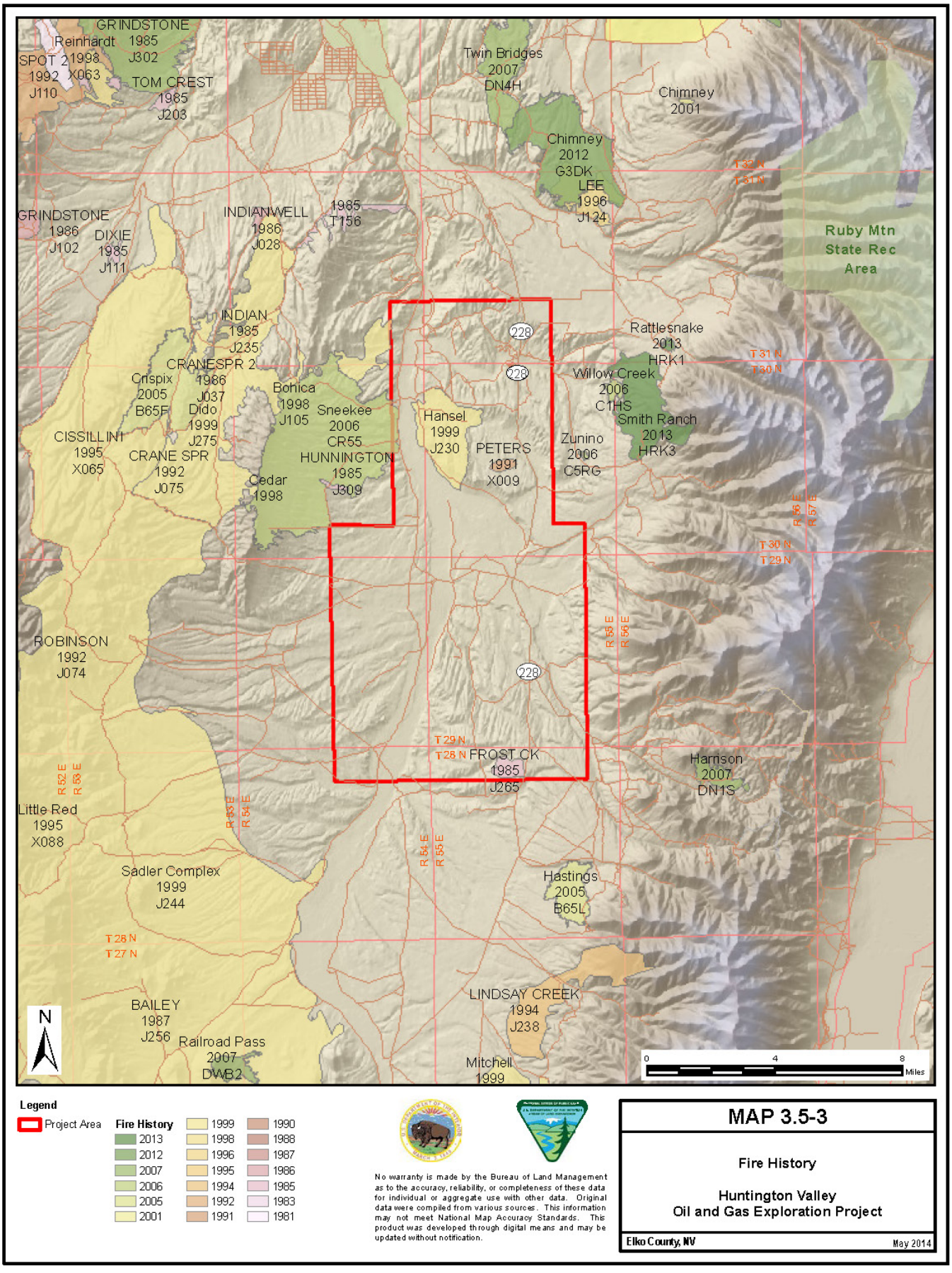
Although wildland fires can occur year-round within the BLM Tuscarora Field Office area, the fire season is generally considered from May to September, with the height of the fire season in July and August (BLM, 2003).

Two BLM Fire Management Units (FMUs) occur within the Project Area; the Cortez FMU and the Elko Wildland Urban Interface FMU. The current fire management strategy in the entire BLM Elko District Office is full suppression of almost all fires (BLM, 2003). BLM fire management has been aggressively attacking and suppressing fires to prevent the establishment of invasive species. BLM Elko's operations include Interagency Hotshot Crews on staff throughout the fire season to address wildfires.

3.5.5.2 Environmental Effects

3.5.5.2.1 Proposed Action Alternative

Proposed well pads would be constructed within both FMUs, with the majority potentially located on the Cortez FMU, in the western portion of the Project Area. Construction of the proposed 20 well pads and associated new and upgraded roads could result in up to 314.1 acres of new surface disturbance within the BLM FMUs. After interim reclamation, long-term disturbance would be up to 221.6 acres. Implementation of the Proposed Action could require travel on 30.9 miles of new and upgraded access roads. Table 2.2-3 (above) provides a detailed description of proposed disturbance by project component.



Legend

Project Area

Fire History

2013	1999	1990
2012	1998	1988
2007	1996	1987
2006	1995	1986
2005	1994	1985
2001	1992	1983
	1991	1981

MAP 3.5-3

Fire History

Huntington Valley
Oil and Gas Exploration Project

Elko County, NV — May 2014

Personal vehicles and those used for land grading and clearing have the potential to spark accidental ignitions during dry conditions. Additionally, workers smoking on-site can potentially be the source of a fire. Vehicular travel, equipment use, and dry conditions combined with flammable vegetation types could pose the risk friction fires that develop into larger scale fires. Wildfires from other areas could also spread into the Project Area, leaving equipment, structures, and project equipment vulnerable to damage and/or destruction.

Cheatgrass is prevalent in the Project Area and provides a large fuel load that can contribute to wildland fires. Once started, the fires tend to burn fast, cover large areas, and increase the frequency of fires in an area (Wildland Fire Associates, 2008). Based on the volume of cheatgrass present and the high risk of fire potential in the Project Area, the Proposed Action could either ignite a fire or be susceptible to potential wildland fires, especially in dry conditions during the fall. To decrease the potential for fire ignition and in preparation for a wildland fire, Noble has identified fire prevention measures (Appendix K).

Mitigation Measures

In addition to the Project Design Features (see Section 2.2.1.6), the BLM has identified the following mitigation measure to further reduce effects to fire management:

- If a fire is caused by the Proposed Action, Noble shall be responsible for fire suppression costs.

3.5.5.2.2 Well Pad K2J Access Alternative

Direct and indirect impacts resulting from fire under the Well Pad K2J Access Alternative would be the same as those described above for the Proposed Action Alternative.

3.5.5.2.3 No Action Alternative

Under the No Action Alternative, there would be no impacts to fire management from the Proposed Action Alternative or the Well Pad K2J Access Alternative.

3.5.5.3 Cumulative Effects

The CESA for fire management is the Project Area (see Table 3.1-2). Of the 63,495 acres between 1999 and 2013, 2,680 acres have been impacted by fire, and vegetation treatments have been applied to 1,170 acres. The surface disturbance associated with the past and present actions and RFFAs (e.g., rights-of-way, pipelines, oil and gas activities, mines) is estimated to be 476 acres, and when combined with the 314 acres of surface disturbance proposed for the Project, the total is 790 acres or 1 percent of the CESA (see Table 3.4-3). A portion of SR 228 is located within the CESA.

Cumulative effects that could impact fire management include: wildland fire, oil and gas exploration, dispersed recreation (i.e. hunting, camping, etc.), grazing, and OHV use (see Table 3.4-3). These described cumulative effects would continue under the No Action Alternative. As described above, with implementation of Noble's Fire Protection Measures (Appendix K) and the mitigation described above, additional risks associated with fire, in combination with all other actions are not expected to increase over what is already occurring; therefore, cumulative effects would be minimal.

CHAPTER 4 – TRIBES, INDIVIDUALS, ORGANIZATIONS, OR AGENCIES CONSULTED

The BLM sent letters to or consulted with the following:

Agencies

Attorney General
Carson Water Subconservancy District
Colorado River Commission of Nevada
Commission on Minerals
Department of Administration
Department of Agriculture
Department of Conservation & Natural Resources
Department of Taxation, Local Government, Centrally Assessed Property
Desert Research Institute
Division of Emergency Management
Division of State Lands
Division of State Parks
Division of Water Resources
Hawthorne Army Depot
Indian Commission
Legislative Counsel Bureau
NAS Fallon
Natural Heritage Program
National Nuclear Security Administration
Nellis Division of Emergency Management
Nevada Association of Counties
Nevada Department of Transportation
Nevada Department of Wildlife
Nevada Division of Environmental Protection
Nevada Division of Forestry
Nevada League of Cities
Nevada Public Utilities Commission
Nevada Sagebrush Ecosystem Team
Nevada State Energy Office
Nevada Tahoe Resource Team
State Historic Preservation Office
UNR Bureau of Mines
Wild Nevada

Tribal Interest Groups

Western Shoshone Committee
Western Shoshone Defense Project
Western Shoshone Descendants of Big Smoky

Tribes

Name of Tribe or Band	Date of Contact	Type of Contact	Govt-to-Govt	Info. Sharing	Comments/Notes
Te-Moak Tribe of Western Shoshone	2/27/2013	Letter from BLM	N	N	Invitation to open government-to-government consultation
	3/6/2013	Council meeting	N	N	Comments concerning the complexity of the history and remains in the area, concern that the BLM will do what they want regardless of Tribal concerns. BLM offered government-to-government consultation on this issue – Council declined.
	3/18/2013	Letter from Council	N	N	Verification of support of the South Fork Band taking the lead on this project, urging BLM to allow South Fork Band to participate in the cultural and botanical studies of Huntington Valley.
	5/7/2014	Council meeting	N	Y	Update on the progress of the project and status of the analysis.
Battle Mountain Band	2/27/2013	Letter from BLM	N	N	Invitation to open government-to-government consultation
	4/24/2013	Council Meeting	N	Y	Defer to the South Fork Band. Questions concerning fracking and 3-D seismic exploration. BLM offered government-to-government consultation on this issue – Council declined.
Elko Band	2/27/2013	Letter from BLM	N	N	Invitation to open government-to-government consultation
	4/17/2013	Council Meeting	N	Y	Defer to the South Fork Band. Questions concerning fracking and 3-D seismic exploration.
South Fork Band	2/27/2013	Letter from BLM	N	N	Invitation to open government-to-government consultation
	3/5/2013	Council meeting	N	Y	Location is part of aboriginal territory. Need to have tribal monitors and a full survey for issues of Traditional value/culture
	3/11/2013	Return Interest Notice	N	N	Would like to conduct consultation on the project, request Tribal Monitors on the project.
	3/12/2013	Letter from Council	N	N	Express a desire to conduct continued consultation on this project, requesting Tribal participation in the cultural and biological studies.
	4/1/2013	Council meeting	N	Y	Review and solidify the use of Tribal monitors/Tribal surveyors.

Name of Tribe or Band	Date of Contact	Type of Contact	Govt-to-Govt	Info. Sharing	Comments/Notes
	5-3-2013 - 10-10-2013	Letter from Tribal Monitors	N	Y	Daily monitoring logs and data gathering infomration for South Fork Band.
	8/2/2013	Letter from Tribal Monitors	N	Y	Update on the progress of monitoring and data gathering for the South Fork Band.
	3/17/2014	Letter from Tribal Monitors	N	Y	Final reporting of monitoring and data gathering by the South Fork Band Tribal Monitors
Wells Band	2/27/2013	Letter from BLM	N	N	Invitation to open government-to-government consultation
	3/11/2013	Council meeting	N	Y	No comments.
Shoshone Paiute Tribes of the Duck Valley Indian Reservation	2/27/2013	Letter from BLM	N	N	Invitation to open government-to-government consultation
Confederate Tribes of the Goshute Indian Reservation	2/27/2013	Letter from BLM	N	N	Invitation to open government-to-government consultation
	2/19/2013	Return Interest Notice	N	N	Do not want to conduct consultation
	5/3/2013	Council meeting	N	Y	Offered updated information sharing. Council deferred to the South Fork Band.
Duckwater Shoshone Tribe	2/27/2013	Letter from BLM	N	N	Invitation to open government-to-government consultation
	2/11/2103	Letter from Council	N	Y	Directs BLM to contact Te-Moak Tribe of Western Shoshones as this project is within their traditional homelands.
Yomba Shoshone Tribe	2/27/2013	Letter from BLM	N	N	Invitation to open government-to-government consultation

Name of Tribe or Band	Date of Contact	Type of Contact	Govt-to-Govt	Info. Sharing	Comments/Notes
	3/8/2013	Council meeting			Will there be tribal monitors, when will fracking start, concerned about chemicals going onto the ground and into the water table. Defer to the South Fork Band, Te-Moak Tribe of Western Shoshone. Need tribal monitors during the entire process. BLM offered government-to-government consultation at the beginning of the meeting – Council declined.
Ely Shoshone Tribe	2/27/2013	Letter from BLM		N	Invitation to open government-to-government consultation

CHAPTER 5 – LIST OF PREPARERS

BLM INTERDISCIPLINARY REVIEW

NAME	TITLE	AREA OF RESPONSIBILITY
Rich Adams	Tuscarora Field Manager	Field Manager
Deb McFarlane	Assistant Field Manager	Non-Renewable Resources
Tom Schmidt	Geologist – Project Lead	Hazardous Wastes/Solid Wastes, Public Health and Safety, Geology and Minerals
Nycole Burton	Natural Resource Specialist	Migratory Birds/Special Status Species/Wildlife
Zack Pratt	Outdoor Recreation Planner	Recreation, Visual, Wilderness
Elisabeth Puentes	Realty Specialist	Land use, Right-of-way
Gary Koy	California Trail Center Manager	California Trail
Terri Barton	Range Technician	Weeds
Lea Garcia	Natural Resource Specialist	Livestock Grazing/Rangeland Health/Vegetation
John Daniel	Geochemist/Hydrologist	Water/Air/Soil
Beth Bigelow	Archaeologist	Archaeology/Native American Concerns/National Historic Trails
Victoria Anne	Planning and Environmental Coordinator	National Environmental Policy Act

Edge Environmental, Inc.

Name	Resource/Responsibility
Mary Bloomstran	Project Manager, Document Control and Review
Carolyn Last	Document Control and Review
Jim Zapert Susan Connell	Air Quality
Dan Duce Nikie Gagnon	Soils, Prime or Unique Farmlands
Terry Gulliver	Hydrology, Geology and Minerals
Nikie Gagnon	Water Resources, Land Tenure, ROW
Dwight Chapman Archie Reeve	Migratory Birds Wildlife (Fish, Aquatic, and Terrestrial) Special Status Animal Species Vegetation Invasive, Non-Native Species
Sandra Goodman	Socioeconomics, Transportation and Access, Environmental Justice
Josh Moro	Visual Resources, Recreation, Fire Management, Wilderness
Cultural Resource Analysts, Inc.	Cultural

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Appendix A

Transportation Plan

Appendix B

Detailed Legal Description

Appendix C

Lease Stipulations

Appendix D

Narrative of Completion and Hydraulic Fracturing

Appendix E

Typical Drawings

Appendix F

Huntington Valley Integrated Weed Management Plan

Appendix G

Huntington Valley Reclamation Plan

Appendix H

Noxious Weeds and Non-Native Plant Species Observed within Elko County/Project Area

Appendix I

Greater Sage-Grouse Best Management Practices

Appendix J

Memorandum of Understanding – AQUA Program

Appendix K

Fire Prevention Plan Measures

Appendix L

Baseline Water Quality Data

Appendix M

Species Common and Scientific Names

Appendix N

Bird Species Reported on National Biological Survey Breeding Bird Survey Routes within 100 Miles of the Project Area

Appendix O

BLM Sensitive Animal Species in the BLM Elko District and Elko County, with Potential for Occurrence within the Project Area