BLM

Stillwater and Sierra Front Field Offices, Nevada

ENVIRONMENTAL ASSESSMENT

Fluid Mineral Leasing within Six Areas of Churchill, Lyon, Mineral, and Nye Counties, Nevada on the Carson City District

DOI-BLM-NV-C010-2014-0013-EA

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It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

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TABLE OF CONTENTS

List of Acronyms

ACEC	Area of Critical Environmental Concern
amsl	above mean sea level
APD	Application for Permit to Drill
APE	Area of Potential Effect
ATF	US Bureau of Alcohol, Tobacco and Firearms
AUM	Animal Unit Month
BCC	Birds of Conservation Concern
BLM	Bureau of Land Management
BMP	Best Management Practices
BOR	Bureau of Reclamation
CEQ	Council of Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CO	Carbon Monoxide
COA	Conditions of Approval
CRMP	Consolidated Resource Management Plan
CRR	Cultural Resources Report
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ESD	Ecological Site Description
ET	evapotranspiration
FLPMA	Federal Land Policy and Management Act
FONSI	Finding of No Significant Impact
FPST	Fallon Paiute Shoshone Tribe
GLO	General Lands Office
HMA	Herd Management Area
IBA	Important Bird Areas
IM	Instructional Memorandum
MBTA	Migratory Bird Treaty Act
MLA	Minerals Leasing Act
NDEP	Nevada Division of Environmental Protection
NDOT	Nevada Department of Transportation
NDOW	Nevada Department of Wildlife
NEP	National Energy Policy
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NHT	National Historic Trail
NO2	Nitrogen Dioxide
NRHP	National Register of Historic Places
NSO	No Surface Occupancy
O3	ozone
OHV	Off-Highway Vehicle
Pb	lead

PEIS	Programmatic Environmental Impact Statement
PM	Particulate Matter
PGH	Preliminary General Habitat
PPH	Preliminary Priority Habitat
RCRA	Resource Conservation and Recovery Act
RFD	Reasonably Foreseeable Development
RMP	Resource Management Plan
ROD	Record of Decision
ROW	Right-of-Way
SHPO	State Historic Preservation Office
SO2	Sulfur Dioxide
SOP	Standard Operating Procedures
TCP	Traditional Cultural Property
TST	Timbisha Shoshone Tribe
USC	United States Code
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Service
VRI	Visual Resource Inventory
VRM	Visual Resource Management
WAPT	Wildlife Action Plan Team
WRPT	Walker River Paiute Tribe
WSA	Wilderness Study Area
YPT	Yerington Paiute Tribe
YST	Yomba Shoshone Tribe

1.0 INTRODUCTION/PURPOSE & NEED

INTRODUCTION

The Bureau of Land Management (BLM) Stillwater and Sierra Front Field Offices have jointly prepared this environmental assessment (EA) to analyze impacts to the human and natural environment from leasing of fluid mineral resources on federal lands in selected areas of Churchill, Lander, Lyon, Mineral and Nye Counties, Nevada. This document has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), the Council on Environmental Quality (CEQ) regulations implementing NEPA, and the Federal Land Policy and Management Act of 1976 (FLPMA). The document is consistent with the Consolidated Resource Management Plan (CRMP) of 2001 for the Carson City District, the Shoshone-Eureka Resource Management Plan (RMP) for the Battle Mountain District, and the President's National Energy Policy (NEP), Executive Order (EO) 13212, and the Energy Policy Act of 2005.

Issuing leases for fluid mineral resources is considered a federal action and a commitment to resource development, so it requires NEPA analysis. While issuing a lease for fluid mineral resources confers on the lessee the right to future exploration and development of fluid mineral resources within the lease area, it does not confer the right to explore for or develop fluid mineral resources if such activities would extend beyond the level of casual use. As a result, the proposed issuance of fluid mineral leases would have no direct impacts.

Issuance of fluid mineral leases could have indirect impacts because such leasing represents a commitment of resources, and it is reasonably expected that subsequent exploration and development activities would occur. The EA therefore presents a broad scope analysis of the potential indirect and cumulative impacts from fluid mineral leasing in selected areas of Churchill, Lander, Lyon, Mineral and Nye Counties, Nevada, to determine whether these indirect impacts by the lessee could be significant.

For clarity in this document, both the BLM and other federal land together will be referred to as federal lands. Federal lands also include split estate lands, where the government disposed of the surface estate and retained the mineral rights. Fluid minerals referred to in this document include non-renewable energy resources such as oil and gas as well as geothermal resources, a source of renewable energy.

Background for Fluid Mineral Resource Leasing

Oil and Gas Leasing

Oil and gas resources generally include oil, oil shale, native asphalt, solid and semisolid bitumen, and bituminous rock (including oil-impregnated rock or sands from which oil is recoverable only by special treatment after the deposit is mined or quarried) or gas (excepting helium). Oil and gas resources in federal lands are subject to lease under the Mineral Leasing Act of 1920, as amended and supplemented (30 United States Code [USC] 181 *et seq*.), and the onshore oil and gas leasing regulations (43 Code of Federal Regulations [CFR] 3100).

After a lease has been granted, it is reasonably foreseeable that the operator may propose subsequent exploration and development activities for BLM approval. These would require BLM authorization and, if necessary, environmental review. For exploration other than casual use activities, the operator must file an exploration permit that identifies, among many things, the areas to be explored and the method of exploration. When the operator has filed this permit with the local BLM office, the Proposed Action in

the exploration permit undergoes NEPA review to determine if there are any environmental conflicts in the area to be disturbed. If so, the BLM may, at its discretion, approve or disapprove the permit or modify it by requiring additional mitigating measures. Should the operator not be willing to accept the decision, the permit can be modified and resubmitted, or the decision can be appealed.

The development phase occurs when the operator has located a potentially economic reservoir. The operator must file an operations plan to describe how an operator will drill for and test the oil and gas resources covered by the lease. The action proposed in the operations plan would undergo NEPA review by the local BLM office to evaluate the possible environmental impacts of the action. If environmental conflicts are likely to occur, the BLM may again approve, modify, or disapprove the plan.

Barring abandonment of exploration and development wells, the final phase of this process is the creation of, for example, a production well. After the appropriate paperwork is filed with the local BLM office, the Proposed Action again undergoes the approval process. Should this drilling operation result in producing wells, continued monitoring would be required to check for any hydrocarbon spills resulting from leaking pipelines, overfilled tank batteries, or tanker truck spills. This area would need continued monitoring to ensure safety for people, livestock and wildlife.

Oil and gas exploration and production upon BLM managed land are conducted through leases with the BLM and are subject to terms and stipulations to comply with all applicable federal and state laws pertaining to various considerations for sanitation, water quality, wildlife, safety, and reclamation. Stipulations may be site specific and are derived from the environmental analysis process.

All lands available for oil and gas leasing are offered for competitive oral bidding. The BLM Nevada State Office is required to hold sales for such lands at least quarterly. At least 45 days before a competitive auction, lands to be offered for competitive lease sale are posted in the Nevada State Office. At the day of the auction, the minimum acceptable bid of $2 per acre, total first years rental and a $75 administration fee must be paid. The remainder of the bonus bid for each parcel is due within 10 working days. The lands offered in leasing units will be a maximum of 2,560 acres per lease. Only lands that have been offered competitively and receive no bid are made available for noncompetitive leasing. Lease offers are not made for less than 640 acres and may not include more than 10,240 acres. Leases are issued for a primary term of 10 years. The amount of rental for leases will be $1.50 per acre for the first 5 years of the lease term and $2 per acre for any subsequent year. A royalty rate of 12.5 percent on all leases is required on the amount or value of the production removed or sold.

Geothermal Leasing

A geothermal lease is for the earth’s heat resource where there is federal mineral estate. Geothermal resources are underground reservoirs of hot water or steam created by heat from the earth. Geothermal steam and hot water can reach the surface of the earth in the form of hot springs, geysers, mud pots, or steam vents. These resources also can be accessed by wells, and the heat energy can be used for generating electricity or other direct uses, such as heating greenhouses and aquaculture operations or for dehydrating vegetables. Geothermal resources on federal lands are subject to lease under the Geothermal Steam Act of 1970, as amended (30 USC § 1001, et seq.), and geothermal resource leasing regulations (43 CFR §3200).

Developing geothermal resources on federal lands involves four phases; leasing, exploration, development/operation and close-out. The first phase is to issue a lease. Leasing of geothermal resources confers an implied right to the lessee to explore and or develop the geothermal resource. The act of

leasing does not directly result in surface disturbance activities; however ground disturbance would occur during the second phase, exploration and phase three, development. Phase four, close-out, would involve removing facilities and reclaiming the site. The BLM would require a separate site-specific NEPA analysis for exploration, development/operation, and close-out phases.

Geothermal leases are usually issued for a ten-year period. Once a geothermal resource is developed within the lease area, the lease allows the lessee use of the resource for up to 40 years. Leases are initially issued through a competitive process. Only lands that have been offered competitively and receive no bid are made available for noncompetitive leasing. Most lease applications are for a minimum of 640 acres.

Location of the Proposed Action
The Proposed Action is located on the federal lands open to leasing which are encompassed by six discrete "lease areas" within Churchill, Lander, Lyon, Mineral and Nye Counties, Nevada (Figures 1 through 7). The six lease areas comprising the Proposed Action are described as:

- Wabuska Lease Area
  T. 15 N., R. 25 E.
  Mount Diablo Base and Meridian
  Lyon County, Nevada

- Fallon Lease Area
  T. 18 & 19 N., R. 28, 29 & 30 E.
  Mount Diablo Base and Meridian
  Churchill County, Nevada

- Dixie and Edwards Creek Valley Lease Area
  T. 19 N.; R. 37, 38, 39 & 40 E.
  T. 20 N.; R. 34, 35, 37, 38 & 39 E.
  T. 21 N.; R. 34, 35, 36, 38, 39 & 40 E.
  T. 22 N., R. 33, 35 E.
  T. 22 & 23 N.; R.36, 37, 38, 39 & 40 E.
  T. 24 N.; R. 38, 39 & 40 E.,
  Mount Diablo Base and Meridian
  Churchill and Lander Counties, Nevada

- Gabbs Valley Lease Area
  T. 11, 12 & 13 N.; R. 32, 33, 34, 35 & 36 E.
  T. 14 N., S 1/2; R. 32, 33, 34, 35, 36 & 37 E.
  Mount Diablo Base and Meridian
  Mineral and Nye Counties, Nevada

- Teels Marsh Lease Area
  T. 4 N., R. 32 & 33 E.
  Mount Diablo Base and Meridian

PURPOSE & NEED

Oil and gas leasing is necessary to provide oil and gas companies with new areas to explore and potentially develop oil and gas resources. Leasing is proposed to meet requirements of the Mineral Leasing Act of 1920, as amended, the Mining and Minerals Policy Act of 1970, and the Federal Onshore Oil and Gas Leasing Reform Act of 1987 (Reform Act).

An increased demand for domestic sources of renewable and non-renewable energy has resulted in the Nevada BLM receiving numerous applications to lease federal lands for fluid mineral exploration and development. Oil and gas are marketable resources that meet the public's need for energy. The majority of the lease applications residing on the BLM Carson City District are located in the areas known to have fluid mineral resource potential. The sale of oil and gas leases is needed to allow continued exploration for additional petroleum reserves which would help the United States meet its growing energy needs and to enable the United States to become less dependent on foreign oil sources.

In response to the EO 13212, BLM issued a NEP Implementation Plan in June 2001, which directs the BLM to process leases, in a timely manner, in order to help support efforts to increase energy production from federal lands, while preserving the health of the public lands. This action is being initiated to facilitate the BLM Carson City District's implementation of the requirements in Executive Order 13212. The proposed action is needed to expedite the processing of both pending and anticipated future lease applications on BLM managed lands within these areas in the Carson City District.

LAND USE PLAN CONFORMANCE STATEMENT

The proposed action and alternatives described below are in conformance with the Carson City Field Office CRMP of May 11, 2001. Management Actions/Decisions found on:

- Page #MIN-1, RMP Level Decisions, Desired Outcomes, 1. Encourage development of energy and mineral resources in a timely manner to meet national, regional and local needs consistent with the objectives for other public land uses

- Page #MIN-5, Standard Operating Procedures: Leasable Minerals, 5. Oil, gas, and geothermal exploration and production upon BLM land are conducted through leases with the Bureau and are subject to terms and stipulations to comply with all applicable federal and state laws pertaining to various considerations for sanitation, water quality, wildlife, safety, and reclamation. Stipulations may be sit specific and are derived from the environmental analysis process.

RELATIONSHIPS TO STATUTES, REGULATIONS, AND OTHER PLANS

Purchasers of oil and gas leases are required to abide by all applicable federal, state, and local laws and regulations. This includes obtaining all required permits should lease development occur. Federal regulations and policies require the BLM to make public land and resources available based on the principle of multiple use. At the same time, it is BLM policy to conserve special status species and their habitats, and ensure that actions authorized by the BLM do not contribute to the need for the species to become listed as threatened or endangered by the United States Fish and Wildlife Service (USFWS).

The BLM must adhere to Section 106 of National Historic Preservation Act (NHPA). The BLM also must comply with Nevada State Historical Preservation Office (SHPO) protocol agreement, which is authorized by the National Programmatic Agreement between the BLM, the Advisory Council on

Historic Preservation, and the National Conference of State Historic Preservation Officers. As the BLM reviews draft parcel locations, the cultural resource staff reviews the locations to determine if any are within known areas of cultural or archeological concern. If potential Traditional Cultural Property (TCP) or heritage-related issues are identified, such parcels may be withheld from the sale while coordination or consultation with Native American groups is conducted.

The Proposed Action and alternatives will be in conformance with the NEPA of 1969, (P.L. 91-190 as amended (42 USC §4321 et seq.); MLA of 1920 as amended and supplemented (30 USC 181 et seq.); the Federal Oil and Gas Leasing Reform Act of 1987, which includes the regulatory authority under 43 CFR 3100, Onshore Oil and Gas Leasing; General, and Title V of the FLPMA of 1976 Right-of-Way (ROW) under regulatory authority under 43 CFR 2800 for ROWs, Programmatic Environmental Impact Statement (PEIS) for Geothermal Leasing in the Western United States (BLM and USFS, 2008) at http://www.blm.gov/geothermal_eis.

SCOPING AND ISSUE IDENTIFICATION

Internal Scoping

Internal scoping meetings for the BLM were initiated on February 24, 2014, and a site visit was conducted on March 6, 2014. During that time, BLM personnel identified key issues and concerns regarding the Proposed Action.

External Scoping

Scoping letters detailing the content of the EA were sent out to Churchill, Lander, Lyon, Mineral, and Nye Counties on November 19, 2008. The Bureau of Reclamation (BOR) was issued a preliminary copy of the EA on December 11, 2009. The Fallon Paiute-Shoshone Tribe (FPST), Walker River Paiute Tribe (WRPT), Yerington Paiute Tribe (YPT), Yomba Shoshone Tribe (YST) and Timbisha Shoshone Tribe (TST) were notified of the proposed lease sale via certified letter on October 29, 2008, and the FPST were notified of additional lease parcels on February 25, 2014. Comments were received from the BOR (see letter of December 17, 2008 in Appendix B) as a result of scoping. Representatives from Lander, Lyon and Nye Counties indicated that they had no comments or concerns. Comments received as a result of the tribal scoping are detailed later in this chapter.

2.0 PROPOSED ACTION AND ALTERNATIVES

PROPOSED ACTION

The BLM is presently considering leasing 30 parcels covering approximately 56,269 acres of Federal land in Churchill, County, Nevada. The Proposed Action is to offer for competitive sale 27 of the 30 nominated parcels that were sent to the Carson City District Office for review. The acreage nominated was 56,269 acres and the acreage to be offered is 42,675 acres. Five (5) parcels and portions of ten (10) parcels amounting to 13,594 acres have been identified for removal due to specific resource concerns. The Proposed Action is to lease some or all of these pending lease applications, as well as any anticipated future fluid mineral lease applications within the six lease areas comprising the "project area". The fluid mineral lease areas encompass more than one-million acres of federal and private land throughout the west-central part of Nevada. In general, federal land occupies roughly half of the Wabuska and Fallon lease areas, while the four remaining lease areas are comprised almost entirely of federal land.

Lands not included for consideration within the subject lease areas, and therefore not assessed under the Proposed Action, are any lands not open to fluid mineral leasing such as lands within Wilderness Areas, Wilderness Study Areas (WSAs), Areas of Critical Environmental Concern (ACECs), or National Conservation Areas. However, due to several lease areas being adjacent to WSAs a brief discussion is provided in the analysis section for reader clarification. Also excluded are tribal lands, wildlife refuges, wildlife management areas, and private land with titles that include all fluid mineral rights.

Leasing fluid mineral resources by the BLM vests with the lessee a non-exclusive right to future exploration and an exclusive right to produce and use the fluid mineral resources within the lease area for a 10-year period subject to existing laws, regulations, formal orders, and the terms and stipulations in or attached to the lease form. Lease issuance alone does not authorize any ground disturbing activities to explore for or develop fluid mineral resources beyond casual use without site-specific approval for the intended operation. Such approval would require a separate site specific environmental analysis.

Resource Protection Stipulations

Land use plans will continue to serve as the primary vehicle for determining the necessity for lease stipulations (BLM Manual 1624). A lease stipulation is a provision that modifies standard lease rights; stipulations are in addition to restrictions applied to fluid mineral operations by federal regulations and become part of the lease, superseding any inconsistent provisions of the standard lease form. Stipulations typically fall into one of the following categories and may be site-specific or general in their application:

- No Surface Occupancy (NSO) – Use or occupancy of the land surface for fluid mineral exploration or development is prohibited to protect identified resource values;

- Timing or Seasonal Restriction – Prohibits surface use during specified time periods to protect identified resource values (typically does not apply to the operation and maintenance of production facilities);

- Controlled Surface Use – Use and occupancy is allowed, but identified resource values require special operation constraints that may modify lease rights; or,

- Special Administration Stipulation – Used when special external conditions require use of a one-of-a-kind stipulation that is not used in any other area or situation (such as preexisting agreements with other agencies).

Documentation of the necessity for a stipulation is disclosed in land use plans. Land use plans also establish the guidelines by which future waivers, exceptions, or modifications may be granted. Past land use planning efforts in the BLM Carson City and Battle Mountain Districts have resulted in RMP level decisions which identify specific areas that are either closed to fluid mineral leasing or where certain restrictions apply (BLM [CRMP], 2001; Shoshone-Eureka Resource Management Plan, 1986). The land use planning process also develops general stipulations commonly referred to as standard operating procedures (SOPs).

During the site-specific environmental analysis, best management practices (BMPs) appropriate to each site-specific activity would be included as conditions of approval (COA) in permits. More information on BMPs for oil & gas and geothermal operations can be found on the BLM Washington Office Fluid Minerals web site in the Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (BLM and USFS, 2007) at http://www.blm.gov/bmp; and, in the Programmatic Environmental Impact Statement (PEIS) for Geothermal Leasing in the Western United States (BLM and USFS, 2008) at http://www.blm.gov/geothermal_eis.

In addition, the BLM and United States Forest Service (USFS) prepared the PEIS for Geothermal Leasing in the Western United States (BLM and USFS, 2008) to standardize geothermal and fluid mineral leasing and the permitting for fluid minerals operations on federal lands. That document consolidated and updated many of the mitigation measures, standard stipulations, and COA from various BLM and USFS documents addressing geothermal and fluid mineral leasing and development, including RMPs, forest plans, and other environmental documents for fluid mineral leasing and development. The Record of Decision (ROD) from that PEIS, signed on December 17, 2008, will serve to amend and update exiting RMPs and forest plans and provide for the consistent mitigation of fluid minerals operations by federal land management agencies.

Stipulations provided in the PEIS would serve as the minimal level of protection and would be adopted into local land use plans (BLM and USFS, 2008). For example, if an administrative unit has eligible wild and scenic rivers, the wild river stipulation would apply. If an existing land use plan offers more protective measures or has resource specific commitments (e.g., memorandum of understanding for cultural resources), those more protective measures would apply instead. Existing land use plans would also be used to help identify locations of applicability, buffer sizes, and timing conditions for the stipulations.

The BOR has established Special Administration Stipulations for both oil & gas and geothermal leasing specific to the protection of facilities and infrastructure on lands under their jurisdiction. These stipulations offer more protection than the stipulations provided in the standard lease form and are applicable to all oil & gas and geothermal leases on lands under BOR jurisdiction.

Appendix B contains a complete list of stipulations applicable to the federal lands in the area of the Proposed Action including: RMP level closures or restrictions; SOPs; and, the recommended stipulations and BMPs from the PEIS for Geothermal Leasing in the Western United States (BLM and USFS, 2008); and, the standard oil & gas and geothermal lease forms (3100-11 and 3200-24). Appendix B also contains restrictions and closures pertaining to pending lease applications on lands under BOR

jurisdiction as well as the respective BOR Special Administrative Stipulations for both oil & gas and geothermal leasing.

Proposed Lease Areas

Wabuska Lease Area

The Wabuska Lease Area encompasses one township (T. 15 N., R. 25 E.) comprising approximately 23,000 acres at the north end of Mason Valley in Lyon County, Nevada (see Figure 2). The land status is divided equally between federal (BLM) and private ownership. The federal land is concentrated for the most part in the northern half of the lease area. Wabuska Hot Springs resides on private land near the center of the lease area. The Walker River intersects the southeast corner of the lease area within the Mason Valley Wildlife Management Area managed by the Nevada Division of Wildlife (NDOW). A one-megawatt geothermal plant is in operation on private lands within the Wabuska Lease Sale Area. At present, no fluid mineral lease parcels are proposed on federal lands within the Wabuska Lease Area. The Proposed Action will analyze the potential direct, indirect and cumulative impacts from anticipated future fluid mineral leasing on federal lands within the Wabuska Lease Area. No area specific fluid mineral leasing restrictions currently exist for federal lands within the Wabuska Lease Area.

Fallon Lease Area

The Fallon Lease Area encompasses approximately 132,000 acres surrounding the City of Fallon, in Churchill County, Nevada (see Figure 3). The land status in the area is divided equally between federal (BOR, BLM and Military) and private ownership. The Proposed Action will analyze for potential direct, indirect and cumulative impacts from anticipated future fluid mineral leasing on federal lands within the Fallon Lease Area. The following area specific restrictions apply to fluid mineral leasing within the Fallon Lease Area:

- NSO may occur in association with fluid mineral leasing due to high resource values on the following lands: T.18N., R.30E., Sections 19 E½, 22, 27, 28, 29, 30 NE¼, 32 E½ & NW¼, 33, 34, 35, 36;

- A 640 acre portion of the Grimes Point Archaeological Area (in T.18N., R.30E., Sec. 15, W½NE¼, E½NW¼, and Sec. 21, SW¼NE¼, S½NW¼, S½) is closed to geothermal leasing (see Figure 3);

- Special administration stipulations concerning NSO have been established to prevent damage to any BOR dams, reservoirs, canals, ditches, laterals, tunnels, and related facilities, and contamination of the water supply therein, and avoid interference with recreation development and/or impacts to fish and wildlife habitat;

- The BOR has recommended that no leasing occur within the Fallon Lease Area in selected areas (see BOR letter in Appendix B); and,

- The Naval Air Station at Fallon is closed to fluid mineral leasing.

Dixie and Edwards Creek Valley Lease Area

The Dixie and Edwards Creek Valley Lease Area encompasses approximately 384,000 acres within Dixie and Edwards Creek Valleys and at the northeast end of the Clan Alpine Mountains in Churchill County, Nevada (see Figure 4). The lease area also includes a portion of the extreme western margin of Antelope Valley in Lander County, Nevada. The area is comprised almost entirely of federal (BLM and

Military) land. At present, thirty (30) oil & gas lease parcels totaling approximately 56,269 acres are proposed on federal lands within the Dixie and Edwards Creek Valley Lease Area. The Proposed Action will analyze the potential direct, indirect and cumulative impacts from currently proposed and anticipated future fluid mineral leasing on federal lands within the Dixie and Edwards Creek Valley Lease Area. The Dixie Valley Training Area is closed to geothermal leasing under the Military Lands Withdrawal Act of 1999.

Gabbs Valley Lease Area

The Gabbs Valley Lease Area encompasses approximately 391,000 acres in the Gabbs and Lodi Valleys in Mineral and Nye Counties north and west of the Town of Gabbs, Nevada (see Figure 5). The area is comprised almost entirely of federal (BLM) land. The Proposed Action will analyze the potential direct, indirect and cumulative impacts from anticipated future fluid mineral leasing on federal lands within the Gabbs Lease Area. No area specific fluid mineral leasing restrictions currently exist for federal lands within the Gabbs Lease Area.

Teels Marsh Lease Area

The Teels Marsh Lease Area encompasses approximately 47,000 acres south of the small settlement of Marietta at the southern end of Mineral County, Nevada (see Figure 6). The area is comprised almost entirely of federal (BLM) land. The Teels Marsh area is home to the nation's first formally recognized wild burro range which is managed by BLM. The 68,000-acre range encompasses a majority of the Teels Marsh lease area and is home to approximately 85 burros. The Proposed Action will analyze the potential direct, indirect and cumulative impacts from anticipated future fluid mineral leasing on federal lands within the Teels Marsh Lease Area. No area specific fluid mineral leasing restrictions currently exist for federal lands within the Teels Marsh Lease Area.

Rhodes Salt Marsh Lease Area

The Rhodes Salt Marsh Lease Area encompasses approximately 46,000 acres south and east of Sodaville in southeast Mineral County, Nevada (see Figure 7). The area is comprised almost entirely of federal (BLM) land. The Proposed Action will analyze the potential direct, indirect and cumulative impacts from anticipated future fluid mineral leasing on federal lands within the Rhodes Salt Marsh Lease Area. No area specific fluid mineral leasing restrictions currently exist for federal lands within the Rhodes Salt Marsh Lease Area.

ALTERNATIVES

NO ACTION ALTERNATIVE

A second alternative considered is the No Action Alternative or no leasing. Under this alternative, the BLM would reject the pending and anticipated future leases within the subject lease areas and future exploration and development could not occur. Implementation of this alternative is inconsistent with the Federal Energy Policy to promote the development of environmentally attractive energy resources. However, the BLM could adopt the No Action Alternative if the Proposed Action would result in unacceptable impact to the federal lands.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

The Carson City District staff considered leasing all 30 parcels that were nominated for leasing for the September 2014 lease sale. However, during scoping, it was determined that there were specific resource conflicts and land use conflicts that would require deferring specific parcels. This Alternative has been eliminated from further analysis.

Reasonably Foreseeable Development Scenarios

A Reasonably Foreseeable Development (RFD) scenario for fluid minerals is a long-term projection of fluid minerals exploration, development, production, and abandonment or close-out activity. An RFD provides an example of fluid minerals activity in a defined area for a specified period of time, and projects a baseline scenario of activity assuming all potentially productive areas can be open under standard lease terms and conditions, except those areas designated as closed to leasing by law, regulation, or executive order.

The baseline RFD provides the mechanism to analyze the effects that discretionary management decisions have on fluid mineral activity. The RFD also provides the basic information that could be analyzed in the NEPA document under various alternatives. The RFD discloses indirect future or potential impacts that could occur once the lands are leased. A RFD scenario for the Proposed Action and a description of the various types of activities that could be expected to occur subsequent to leasing is included in Appendix C.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter identifies and describes the current condition and trend of elements or resources in the human environment which may be affected by the Proposed Action or Alternatives and the environmental consequences of effects of the action(s). This chapter will incorporate by reference and tier off of the respective affected environment and environmental consequences analyses (Chapters 3 and 4) of the PEIS for Geothermal Leasing in the Western United States (BLM and USFS, 2008) at http://www.blm.gov/geothermal_eis, where appropriate.

General Setting

The project area resides in a high-desert environment characterized by arid to semiarid conditions, bright sunshine, low annual precipitation, and wide daily ranges in temperature. The terrain consists of expansive valleys containing playas and dunes surrounded by steep mountainous areas shrouded by alluvial fans. Elevations range from 3,000 feet above mean sea level (amsl) to 9,000 feet. The climate is controlled primarily by the rugged and varied topography to the west, particularly the Sierra Nevada Range. Prevailing westerly winds move warm, moist Pacific air over the western slopes of the Sierra Nevada Range where the air cools, condensation takes place, and most of the moisture falls as precipitation. As the air descends the eastern slope, compressional warming takes place resulting in minimal rainfall. Annual precipitation in the area of the Proposed Action is greatest in the mountains and least in the valleys. The higher elevations (above 8,000 feet amsl) may receive up to 25 inches of precipitation annually and the lower elevations (below 6,000 feet amsl) can receive less than 10 inches annually (PRISM precipitation map of Nevada, Oregon State University Spatial Climate Analysis Service 2002).

Wabuska Lease Area

The Wabuska Lease Area is centered on the settlement of Wabuska, about 12 miles north of Yerington, Nevada. The lease area is located directly northwest of the Mason Valley Wildlife Management Area and contains a portion of the Desert Mountains, Adrian Valley, and Mason Valley. Elevations range from just less than 4,300 feet amsl in the lowlands within valley areas to 5,740 feet in the Desert Mountains. Vegetation includes shadscale in higher elevations, salt desert shrub in intermediate elevations, and barren playa in low elevations. Emergent riparian species surround the Mason Valley Wildlife Management Area. Some of the southern portion of the area consists of active agricultural fields.

Fallon Lease Area

The Fallon Lease Area is located predominantly within the Lahontan Valley. The Lahontan Mountains are in the southeast corner of the lease area. The northern extent of Carson Lake, and Soda and Little Soda Lakes are in the northwest corner along with the Carson River. The City of Fallon is in the north central portion where Alternate U. S. Highway 95 and U. S. Highway 50 bisect. The Fallon Naval Air Station is in the central portion of the lease area and the northwest corner of the US Naval Reservation is located in the southeast corner and the northeast corner borders the Stillwater National Wildlife Refuge. The Fallon Paiute-Shoshone Tribe/Indian Reservation is in the northeast portion of the lease area on the northern boundary. The entire lease area is located within Churchill County and is 139,412 acres in size; approximately 50% is managed by the BOR and BLM, and 50% is private land. Elevations range from 3,905 feet AMSL in the Lahontan Valley and the highest is 4,448 feet in the Lahontan Mountains at Salt Wells Mountain.

Dixie and Edwards Creek Valley Lease Area
The Dixie and Edwards Creek Valley Lease Area is located within portions of Dixie Valley north and east of Job Peak on the southwest end, east of the Humboldt Salt Marsh and interfacing along the alluvial fans west of the Clan Alpine Mountains and a small area north and west of Boo Spring, the northeast point of the Clan Alpine Mountains at the Augusta Mountain interface, the majority of Edwards Creek Valley at the interface of the east side of the Clan Alpine Mountains, the west side and portions of the New Pass and Desatoya Ranges on the east side to the Churchill and Lander County line, excluding the New Pass pass and New Pass Mine. The lease area is 423,346 acres in size, approximately 90% is on federal lands and 10% is privately owned. Elevations range from just less than 3,365 feet amsl in the lowlands of Dixie Valley, 5,052 feet in the lowlands of Edwards Valley to the highest elevation of 9,002 feet in the Desatoya Range in the eastern most portion of this lease area. The area is watered by west facing slopes draining into both valleys. Edwards Creek Valley contains an extinct lake bed. Vegetation ranges from near-bare playa flats, salt desert scrub, sagebrush communities and pinyon and juniper woodland within higher elevations.

Gabbs Valley Lease Area
The proposed lease area is located within Gabbs and Lodi Valleys, Lodi Hills, the west central area including Downeyville and northern end of the Paradise Range, southern edge of the Sand Springs Range including Big Kasock Mountain, southern most Fairview Valley and the majority of the Monte Cristo Mountains including Mount Annie, Fissure Ridge and Black Hills within portions of Nye and Mineral Counties. The majority of the northern boundary of the lease area is the Churchill and Mineral County boundary until it diverges at the Churchill and Nye County line. The lease area is 379,088 acres in size and approximately 90% is on federal lands and 10% is privately owned. Elevations range from 4,100 feet amsl in Gabbs Valley, to the highest elevation of 7,543 feet in the Paradise Range followed by Big Kasock Mountain at 7,142 feet in the Sand Springs Range. Sand dunes are prominent on the north, west and southern edges of Gabbs Valley. Water resources were identified by the examination of topographic maps. Hot and cold springs, and developed wells would indicate the presence of water subsurface in the dry alkali valleys within the lease area. The subsurface water is recharged by the runoff from the various range and hills surrounding the valleys including several washes (Nugent, Phillips, Gabbs and Finger Rock). Vegetation ranges from Great Basin desert shrub communities (salt desert scrub, greasewood, and sagebrush) to scattered junipers at mid to higher elevations. Riparian plants have been identified near open cold springs or previously developed hot springs.

Teels Marsh Lease Area
The Teels Marsh Lease Area includes the Teels Marsh surrounded by the Excelsior Mountains on the northern boundary and hills on the west side of the marsh and lease area and the Candaleria Hills on the east and south sides within Mineral County. The lease area is 46,826 acres in size and approximately 90% is on federal lands and 10% is privately owned. Elevations range from 4,920 feet amsl in the Teels Marsh to the highest elevation of 7,854 feet in the Excelsior Mountains. Run off from the Excelsior Mountains and surrounding hills drain into the marsh. Springs were noted on the topographic maps within and on the outer edge of the southern boundary of the lease area. Vegetation ranges consists of salt desert scrub, greasewood flats with some barren sand dunes and playa margins, sagebrush and perennial communities, grasslands within the lowlands with pinyon and mountain mahogany at the higher elevations.

Rhodes Salt Marsh Lease Area
The Rhodes Salt Marsh Lease Area is located on the south end of Soda Spring Valley including the Rhodes Salt Marsh and the east side of the area is the southwest extent of the Pilot Mountains all located

within Mineral County. Tonopah Junction is located in the west side of the lease area south of Sodaville along alternate Highway 95 and State Route 360. The lease area is 45,738 acres in size and approximately 90% is on federal lands and 10% is privately owned. Elevations range from 4,316 feet amsl in the Rhodes Salt Marsh to the highest elevation of 7,507 feet in the Pilot Mountains. Run off from the Excelsior and Pilot Mountains and the Candaleria Hills drains into the marsh on the west side of the lease area. Springs were noted on the topographic maps within the marsh, in the upper northeast corner of the lease area. Vegetation ranges consists of salt desert scrub, greasewood flats with some barren sand dunes and playa margins, lowland riparian located within the marsh proper, sagebrush communities and pinyon/juniper at the higher elevations.

SUPPLEMENTAL AUTHORITIES

Appendix 1 of BLM's NEPA Handbook (H-1790-1) identifies Supplemental Authorities that are subject to requirements specified by statute or executive order and must be considered in all BLM environmental documents. Table 1 below lists the Supplemental Authorities and their status in the project areas.

Table 1 Supplemental Authorities*

Resource	Present Yes/No	Affected Yes/No	Rationale
Air Quality	Yes	No	Carried Forward in EA.
Areas of Critical Environmental Concern	No	No	There are no Areas of Critical Environmental Concern present within the proposed lease areas.
Cultural Resources	Yes	Yes	Carried Forward in EA.
Environmental Justice	Yes	No	Carried Forward in EA.
Farm Lands (prime or unique)	No	No	There are no prime or unique farmlands present within the proposed lease areas.
Floodplains	Yes	No	Carried Forward in EA.
Invasive, Nonnative Species	Yes	No	Carried Forward in EA.
Migratory Birds	Yes	No	Carried Forward in EA.
Native American Religious Concerns	Yes	No	Carried Forward in EA.
Threatened or Endangered Species (animals)	Yes	No	Carried Forward in EA.
Threatened or Endangered Species (plants)	No	No	There are no Threatened or Endangered plant species present within the proposed lease area.
Wastes, Hazardous or Solid	Yes	No	Carried Forward in EA.
Water Quality (Surface/Ground)	Yes	No	Carried Forward in EA.
Wetlands/Riparian Zones	Yes	No	Carried Forward in EA.
Wild and Scenic Rivers	No	No	There are no wild and scenic rivers present within the proposed lease areas.
Wilderness/WSA	No	No	There is no Wilderness or WSAs present within the proposed lease areas. However this resource is discussed below.

October 2011
**See H-1790-1 (January 2008) Appendix 1 Supplemental Authorities to be Considered.*
Supplemental Authorities determined to be Not Present or Present/Not Affected need not be carried forward or discussed further in the document.
Supplemental Authorities determined to be Present/May Be Affected may be carried forward in the document.

RESOURCES OR USES OTHER THAN SUPPLEMENTAL AUTHORITIES

The following resources or uses, which are not Supplemental Authorities as defined by BLM's Handbook H-1790-1, are present in the area. BLM specialists have evaluated the potential impact of the Proposed Action on these resources and documented their findings in Table 2 below.

Table 2 Resources or Uses Other Than Supplemental Authorities

Resource or Issue**	Present Yes/No	Affected Yes/No	Rationale
BLM Sensitive Species (animals)	Yes	No	Carried Forward in EA.
BLM Sensitive Species (plants)	Yes	No	Carried Forward in EA.
Forest Resources	Yes	No	Under the Proposed Action, there would be no direct impacts on forestry and woodland products because exploration and development activities would not be authorized. Indirect impacts associated with exploration and development could include damage resulting from the contact with equipment. If parcels were developed in the future, site-specific mitigation measures and BMPs would be attached as COAs for each proposed activity, which would be analyzed under their own site-specific NEPA analysis.
General Wildlife	Yes	No	Carried Forward in EA.
Land Use Authorization	Yes	Yes	Carried Forward in EA.
Lands with Wilderness Characteristics	No	No	Not present within the proposed lease areas.
Livestock Grazing	Yes	Yes	Carried Forward in EA.
Minerals	Yes	Yes	Carried Forward in EA.
Paleontological	No	No	A BLM records search was conducted to ensure that no currently identified paleontological resources were present in the parcels that have special interest or importance to the general public. A detailed analysis is not required.
Recreation	Yes	No	Carried Forward in EA.
Socioeconomics	Yes	Yes	Carried Forward in EA
Soils	Yes	No	Carried Forward in EA.
Travel Management	Yes	No	The Proposed Action would not have any effects on Travel or Transportation Management.
Vegetation	Yes	No	Carried Forward in EA.
Visual Resources	Yes	No	Carried Forward in EA.
Wild Horses and Burros	Yes	No	Carried Forward in EA.

October 2011
***Resources or uses determined to be Not Present or Present/Not Affected need not be carried forward or discussed further in the document.*
Resources or uses determined to be Present/May Be Affected may be carried forward in the document.

RESOURCES PRESENT AND BROUGHT FORWARD FOR ANALYSIS (All Resources)
The following resources are those that are either present in the area and may be affected by the Proposed Action or that are not affected by the Proposed Action (leasing) but require further discussion.

3.1 Air Quality

The Clean Air Act was passed in 1970 (and amended in 1990) to reduce air pollution across the US. Specific air pollutants associated with harming human health were identified as criteria pollutants. The criteria pollutants were assigned acceptable airborne concentration levels, and collectively the list was named the National Ambient Air Quality Standards. Under the Clean Air Act, the U. S. Environmental Protection Agency (EPA) is responsible for revising these standards when necessary as new air quality data and related impacts on the human environment become available. The Clean Air Act also mandates the EPA approve state implementation plans to ensure that local agencies comply with the Act.

The EPA established National Ambient Air Quality Standards for the following six criteria pollutants to protect public health and welfare: sulfur dioxide (SO2), nitrogen dioxide (NO2), carbon monoxide (CO), ozone (O3), lead (Pb), and particulate matter (PM).

PM, or particulate pollution, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. The size of particles is directly linked to their potential for causing health problems. The EPA regulates particles that are 10 micrometers in diameter or smaller because those are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. The EPA groups particulate pollution into two categories:

- Inhalable coarse particles, such as those found near roadways and dusty industries, are larger than 2.5 micrometers and smaller than 10 micrometers in diameter (PM10).

- Fine particles, such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller (PM2.5). These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles react in the air.

In addition to criteria pollutants, the EPA, together with the states, also controls air toxics, or hazardous air pollutants. Such substances, if present in the surrounding air, are thought to have serious health impacts. Lists of substances identified as air toxics have been issued by the EPA and some individual states. The details of the list and regulations applied to the hazardous air pollutants may vary among jurisdictions. Due to their minute emissions, fluid minerals exploration and development activities would most likely be exempt from air toxics emissions regulations, depending on the types of technology and local attainment status.

Existing air quality conditions within a given area are described in terms of attainment status. Counties are designated as nonattainment or maintenance areas depending on their ability to meet criteria pollutant standards for air quality. Ambient pollutant levels are expected to be low in the undeveloped regions and negligible in remote areas. Areas with high pollutant levels are typically associated with large amounts of human development or high winds and dusty soil types with little vegetation.

Affected Environment
Various air emissions would result from oil & gas field investigations, exploration activities and the construction of oil & gas operational facilities. Off-highway vehicular travel and the use of unpaved roads would increase the release of fugitive dust particles. The use of internal combustion engines in vehicles and other equipment would result in release of carbon dioxide, carbon monoxide, nitrogen oxides, saturated hydrocarbons, PM10, and the production of photochemical air pollutants such as ozone. Exploration drilling and pumping of oil and natural gas could cause emissions of hydrocarbons and other volatile chemical components into the atmosphere. Inadvertent oil spills in and around pumping equipment, tank farms and trucks, and pipelines could result in the release of fumes of volatile gases into the atmosphere.

Geothermal plants emit small amounts of nitrogen oxides and carbon dioxide and nearly no sulfur dioxide or particulate matter (Geothermal Energy Association, 2007). The primary pollutant of geothermal power plants is hydrogen sulfide, which is naturally present in most geothermal reservoirs. Hydrogen sulfide emissions are maintained below the most stringent standards with the use of sophisticated abatement equipment. Studies carried out in the past few decades estimating emissions from geothermal power plants have concluded that geothermal energy emissions are small and have been reduced by advanced technologies and energy-saving techniques. Steam from a geothermal plant is condensed when passing through a turbine; however, noncondensable gases in the reservoir fluid such as carbon dioxide, hydrogen sulfide, sulfur dioxide, mercury, and several others pass through the turbine without condensing and are released into the atmosphere. The amount of noncondensable gases present and emitted depends on factors such reservoir fluid composition, temperature, method of power generation (flash, binary, or combined cycle), and equipment efficiency (Bloomfield et al., 2003).

Environmental Consequences
There are no direct air quality impacts from issuing leases for future fluid minerals exploration, development, and production activities. None of the lease areas comprising the Proposed Action lay in designated nonattainment or maintenance areas for criteria air quality pollutants.

Air quality would be affected during exploration and development, by an increase in particulate matter (dust), and release of gases and vapors. These effects would most likely be greatest during the development and abandonment or close-out phases. Many of these disturbed areas would be reclaimed shortly after disturbance.

Potential air quality impacts would be minimized through compliance with state and federal regulations, adherence to lease stipulations, and implementation of appropriate BMPs. In accordance with recommended BMPs (BLM and USFS, 2008), operators would coordinate with the Nevada Division of Environmental Protection (NDEP) to develop and implement an air quality monitoring plan.

3.2 Cultural Resources
Pending or future lease parcels within the proposed lease areas would be offered for lease subject to applicable laws and lease conditions. The proposed lease areas may be found to contain historic properties and/or resources protected under the NHPA, American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, E.O. 13007, or other statutes and executive orders. The BLM would not approve any ground disturbing activities that may affect cultural properties eligible to the National Register of Historic Places (NRHP), until it completes its obligations under applicable requirements of the NHPA and other authorities. On all lease areas, once a project specific proposal is submitted, an additional Section 106 cultural resource assessment would be completed where site

specific issues would be addressed as appropriate. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated.

Affected Environment

The BLM Carson City District Office Class I Cultural Resources Report (CRR) completed for this EA adequately summarizes the presence and absence of archaeological inventories and cultural properties located on each proposed lease area (McCabe and Lane, 2008). Pertinent cultural resource information was reviewed and analyzed for the Area of Potential Effect (APE), which is defined as all lease areas comprising the Proposed Action. Cultural resource information available for each of the proposed lease areas varied, with some having very few inventories to others where a significant portion of the lease area was inventoried. In no case is an entire lease area completely surveyed. Un-inventoried portions of lease areas or lease areas with small or minimal inventories were compared to nearby areas with similar land forms. This analysis included an assessment of these lease areas for cultural resource sensitivity based upon elevation, topography, vegetation and water resources especially in areas that have not been previously inventoried. The location of prehistoric archaeological sites varies in predictable ways across the Western, Central, and Eastern regions of the Carson City District. Sites are common in well-watered valley bottoms, near the mouth of mountain-front canyons, near outcrops of toolstone-quality rocks, and in lovally productive resources patch (e.g. deer migration routes or pinyon communities) in mountain ranges. In fact, the distribution and relative proportion of sites and site types in the three regions of the Carson City District are very similar; most of the variation in the counts of site types between the regions is likely due to survey coverage, land status, and size of the region (Young, 2014). A brief summary and analysis of inventories within the proposed lease areas is provided below.

Wabuska Lease Area: Twenty-three previous Class III inventories within the Wabuska Lease Area has covered a total of 895 acres, or approximately 4% of the area. Previous inventories resulted in documentation of 41 sites within the Wabuska study area; 13 of these sites lie entirely or partially on BLM lands. Most of the sites date to the Prehistoric Period and consist of both simple and complex lithic scatters; many of these are located in dune areas with good potential for buried materials and contain evidence of thermal features and include complex assemblages. In the past, hot springs in the area were used by tribal members for a variety of practices and are still considered sacred. Sites dating to the Historic Period include refuse scatters, historic road and railroad grade segments, historic buildings, segments of the Carson & Colorado Railroad, segments of the Nevada Copper Belt Railroad, and the historic site of Thompson, which was a smelter town active between 1910 and the 1920s.

Portions of the lease area are located within the Yerington Mining District. This District has also been known variously as the Mason, Mason Pass, Mason Valley, Ludwig, Indian Spring, and Indian Springs Districts. The District was discovered in 1865 and includes the Singatse Range, Mason Valley, and a portion of the Wassuk Range. The area most important commodity produced within the District has been copper (Tingley, 1992).

Based on the assessment of soils, elevation, topography, vegetation and water resources in surveyed areas with similar conditions, the potential for finding NRHP-eligible sites within the lease area is most likely within lowland areas, where prehistoric sites are expected to be present in moderate to high densities. The occurrence of wetlands within the lease area indicates excellent potential for large significant prehistoric sites with multiple features to be present. A cultural resources predictive model developed by Gnomon, Inc. for the Carson City District that

takes statistical and environmental factors such as landform, soils, vegetation, and distance to water into account is also useful for examining probability of locating prehistoric and historic sites in the lease area (Drews and Ingbar 2007). The model depicts low lying areas as exhibiting "best" and "good" probability (the two highest categories) for containing prehistoric sites; much of the lease area falls within these classifications. Upland areas within the northern portion of the lease area in the Desert Mountains are generally ranked very low to low probability for prehistoric resources.

Probability to locate historic resources, according to this model (Drews and Ingbar 2007), is highest along modern transportation corridors and settlement areas such as Wabuska. Historically, the lease area has been used primarily as an agricultural area and a transportation corridor. The lease area contains portions of the Wabuska Drain, the Perozzo Slough, and number of tertiary irrigation features. Portions of the Southern Pacific Railroad, abandoned Nevada Copper Belt Railroad, abandoned Carson & Colorado Railroad, and U.S. 95A also pass through the lease area. As a result, historical sites related to mining, transportation, and agriculture are likely to be present. Refuse scatters and features related to Thompson, a settlement that processed copper ore, are also likely to be present.

Fallon Lease Area: Approximately 17,852 acres or 13% of the lease area has been inventoried. One hundred and fifty two surveys have been conducted resulting in the identification of 300 cultural resources, both prehistoric and historic. Prehistoric sites are the predominant type identified during these inventories. Although a small percentage of the lease area has been surveyed for cultural resources, the results of the inventories have provided regional understanding of the cultural history and have provided some information regarding the density and diversity of cultural resources both known and likely to be identified. Approximately 21,000 years ago Lake Lahontan submerged most of the lease area and through the process of wave action created rock shelters and caves that have been used by Native Americans as early as 10,000 BP. The area has several natural water sources including two remnant lakes (Soda and Little Soda), the Carson River, the south branch of the Carson River, and the New and Stillwater Sloughs. There are many constructed water sources the S Line and Harmon reservoirs and a series of canals and drains associated with the Newlands Irrigation system. Vegetation includes agricultural fields on private lands, sagebrush, greasewood and saltbush communities, including a variety of native grasses and riparian related vegetation traditionally used by local Native Americans.

The topography, vegetation and water provided a highly desirable location for occupation by people for over 10,000 years. The long term occupation within and adjacent to the lease area has been confirmed by carbon dating textiles recovered from caves and rock shelters along the 21,000 year-old Lake Lahontan shoreline. As the lake receded a new ecosystem evolved, rich in animal and plant resources creating a prime location for the long term occupation of the area further confirmed by the results of the current inventories for both prehistoric and historic occupation of the ever changing landscape, both naturally occurring and through human manipulation.

The resources of the wetland basin and mountain ranges at the end of the Carson River have provided a foundation for prehistoric settlement and subsistence for millennia The long term occupation of the Grimes Point Archaeological area, as well as surrounding areas have been inventoried and recorded over the last 70 years by a variety of anthropologists (Pendleton et. al,

1982). The studies have resulted in the identification of continuous use over the last 10,000 years by Native Americans. Dry caves and rock shelters have yielded significant archaeological materials and other plant information (plant remains, pollen, etc.) that are critical to the understanding of the landscape and the people that inhabited the lease area.

During the analysis for the 2006 Carson City Field Office Geothermal Leasing Environmental Assessment (BLM, 2006), areas very high in cultural resource sensitivity were identified in an around the Grimes Point Archaeological Area by cultural resource staff and through consultation with the Fallon Paiute-Shoshone Tribe. As a result, several locations within the proposed lease area were stipulated as NSO (T. 18 N., R. 30 E.; Sec. 19, E½; Sec. 30, NE¼; Sec. 32, NW¼ and E½; and all of Sections 20, 22, 27, 28, 29, 33, 34, 35 and 36). The ROD from the PEIS (BLM and USFS, 2008) will serve to amend and update the CRMP to reflect that NSO restriction.

Expectations for cultural resources in the areas surrounding the stipulated NSO would be moderate to high and based upon previous inventories the following site types are likely to be identified during future inventories: rock shelters, rock art sites, open sites containing extensive artifact scatters, base camps, resource procurement that would include lithic and plant processing and historic-period resources associated with the traditional use of the region by Native Americans.

Expectations for historic sensitivity are moderate to high for a variety of reasons including but not limited to agricultural, ranching, mining, transportation corridors, and pivotal to the agricultural expansion in the Fallon area, the Newlands Irrigation Project and those components associated with the construction and maintenance of all the aforementioned activities. The Newlands Irrigation Project, formerly the Truckee-Carson Project, was one of the first Reclamation projects. Construction began in 1903 and provides full service irrigation water from the Truckee and Carson Rivers for cropland in the Lahontan Valley near Fallon. Canals and drains support the irrigation and drainage; theses canals and drains are identified on topographic maps throughout the lease area. Due to the historic significance of the Newlands Project and role in the development of agricultural and ranching in Fallon and the surrounding area, the cultural resource sensitivity is rated moderate to high. According to historic General Land Office (GLO) maps, there are many transportation routes throughout the Fallon lease area associated with the various developments both unnamed and named roads including the Overland Road and Smith Toll Road. The Pony Express and later the Lincoln Highway are well documented through the lease area. Borax was mined from the Big and Little Soda Lakes from the mid to late 19th century (Lincoln, 1982). Within the lease area is a small segment of an historic railroad line which was constructed between 1906 and 1907 (Myrick, 1962) by the Nevada and California Railway from Hazen to Fallon. Historic refuse and camps associated with the construction development of the aforementioned historic routes and the Newlands Irrigation system suggest potential for identification of historic resources throughout the lease area as moderate to high.

Dixie and Edward Creek Valley Lease Area: The area on the east side of the Lander County line was not analyzed in this document (see BLM, 2008). Approximately 4,390 acres or 1% of the total lease area acreage has been inventoried. Seventy-five surveys have been conducted resulting in the identification of 100 cultural resources, both prehistoric and historic. Most of the inventories are block surveys for geothermal exploration and linear surveys for communication and power line corridors in Dixie Valley with two bisecting the Clan Alpine Mountains and

southern Edwards Creek Valley within this lease area. The smaller inventories vary in size from one to 40 acres and were conducted for the purpose of mining related exploration and ranching.

Beyond the major river systems of the western and central regions of the Carson City District, perennial drainages fail to breach the mountain fronts and the intervening basins are exceedingly dry. The dry conditions of the Eastern region culminate in Dixie Valley, the lowest basin in the Carson City District and the lowest elevation in Nevada north of the Armargosa Desert (Young 2014).

Although a very small percentage of the lease area has been surveyed for cultural resources the overall results suggest that the vegetation and water have supported various uses on the landscape that include prehistoric and historic occupation. These inventories and the subsequent results have provided regional understanding of the cultural history and have provided some information regarding the density and diversity of cultural resources present.

The previous inventories suggest that this lease area has low to high potential for significant resources dependent upon the location, mountains or valleys. Expectations would be low for resources on extreme slopes and playas, moderate to high near water, including extinct lake shorelines and areas of lithic and plant procurement. Prehistoric site types that have been previously identified or likely to be identified during future inventories including but not limited to the following: rock shelters, rock art sites, open sites containing extensive artifact scatters, base camps, resource procurement that would include lithic and plant processing (high altitude procurement of pine nuts, a highly valued food resource and various seed plant procurement and processing sites) and historic-period resources associated with continued and traditional use of the region by Native Americans.

Potential for 19th and 20th century historic period sites would be moderate to high due to the following historic site types including but not limited to transportation, mining and ranching. Historic transportation corridors within the lease area include the Pony Express, Overland Stage road, Overland Stage station, Overland telegraph line, Lincoln Highway and a number of unnamed routes identified on historic GLO maps reviewed for this lease area. Within or adjacent to the lease area are the Augusta, Alpine and Tungsten Mining districts in the Clan Alpine Range and the New Pass District in the New Pass Range. Prospects, shafts and adits were identified on the topographic maps. Historic ranching (sheep and cattle) has been ongoing throughout the lease area and ranch ruins are identified on topographic maps for Dixie Valley and fields and houses identified on all historic era GLO maps for this lease area. The presence historic refuse and structural remains are directly related to the aforementioned activities and the likelihood of small depositional remains is moderate throughout the lease area.
Based on the assessment of elevation, topography, vegetation and water resources in previously inventoried areas with similar conditions, the potential for finding known or undocumented NRHP-eligible prehistoric resources within this proposed lease area would be moderate to high. Potential for NRHP-eligible historic-period sites related to ranching and mining would be moderate to low, however the aforementioned historic transportation resources that have been recorded and are potentially or currently listed as eligible to the NRHP and based upon the GLO the potential for identifying additional segments related to these routes is moderate to high.

Gabbs Lease Area: One hundred nineteen inventories have been conducted within the lease area resulting in the identification of 139 cultural resources. Approximately 2% of the lease area has

been inventoried. Most of the inventories have been block or linear surveys conducted primarily in association with mining and geothermal exploration, most of the cultural resources that have been recorded are directly associated with mining.

The majority of the cultural resources identified and recorded are associated with the mining that occurred from the middle 19th to the early/middle 20th century. Mining has been an ongoing industry for the last 125 years within the lease area. Several historic mining districts have been documented including Rawhide/Regent, Eagleville/Hot Springs, Broken Hills, Gabbs, Lodi (Mammoth, Marble, Ellsworth), Tolicha (Monte Cristo, Quartz Mountain, and Clarkdale), Rawhide and Rand/Bovard. In most cases towns or camps developed in concert with the mining districts (Lincoln, 1982). Many mines and prospects, shafts, and adits are marked on the topographic map throughout the entire lease area. The expectation of historic mining cultural resources is moderate to high for the following site types including but not limited to remains of mining structures both industrial and living quarters, campsites, larger historic refuse sites associated with towns and large mining concerns, cemeteries (Rawhide), smaller historic refuse deposits associated with mining exploration, cairns, construction associated with the Rawhide Western Railway grade, segment of the Wadsworth-Columbus Freighting Route to Dead Horse Well, roads to and from towns as identified on the 1884 GLO maps (Downeyville, Deadhorse Well to Rawhide and Hot Springs) and various mining exploration site types throughout the lease area. Further examination of the 1884 GLO maps provide additional historic site types including several “house” locations in the Gabbs Valley area most likely associated with agriculture, ranching and stage stops along the aforementioned named roads. The valley is identified as a “dry alkali lake bed with good grazing land”. At least three house locations were identified on the 1884 GLO maps; one house was identified as the “Woodruffs house and well” and was a stage and auto stop (Pendleton et. al, 1982). Expectations for ranching, agricultural or stage stations site types (structures, refuse, fence lines, water lines/Dead Horse Well Water Company [Myrick, 1962]) are moderate to high.

Based on the limited data availability, an assumption can be made that complex prehistoric sites are expected to occur in moderate to high frequency in the sand dunes along the edge of the former dry lake bed or Gabbs Valley and adjacent to the well watered areas both hot and cold springs. As the former lake bed evaporated local Native Americans would have most likely used these locations for the collection of marsh related plants and animals as identified in similar ecosystems within the western and central Great Basin. Expectations would be low for resources on extreme slopes and within the alkaline valley playas bisected by copious drainages Expectations for isolated artifacts and lithic reduction locations within the valleys and surrounding ranges would be low to moderate. Prehistoric site types that may be identified or likely to be identified during future inventories would include but not limited to the following: rock shelters, rock art sites (petroglyphs and pictographs), geoglyphs, open sites containing extensive artifact scatters, base camps, resource procurement that would include lithic reduction or testing of locally occurring chert cobbles and plant processing, and historic-period resources associated with the traditional use of the region by Native Americans.

Teels Lease Area: The proposed lease area includes the Teels Marsh surrounded by the Excelsior Mountains on the northern boundary and hills on the west side of the marsh and lease area and the Candaleria Hills on the east and south sides within Mineral County. The lease area is 46,826 acres in size and approximately 90% is on federal lands and 10% is privately owned. Elevations range from 4,920 feet amsl in the Teels Marsh to the highest elevation of 7,854 feet in the

Excelsior Mountains. Run off from the Excelsior Mountains and surrounding hills drain into the marsh. Springs were noted on the topographic maps within and on the outer edge of the southern boundary of the lease area. Vegetation ranges consists of salt desert scrub, greasewood flats with some barren sand dunes and playa margins, sagebrush and perennial communities, grasslands within the lowlands with pinyon and mountain mahogany at the higher elevations.

Sixteen inventories have been conducted resulting in the identification of approximately 31 cultural resources of both prehistoric and historic site types. Approximately 85 acres has been inventoried for cultural resources, less than 1% of the lease area. The predominant site type at this juncture is prehistoric with extensive occupation along the marsh boundaries and within the sand dunes. Prehistoric site types have been identified but few have been recorded in the lease area. Expectations are high for the following sites types adjacent to the marsh during future inventories, antelope drives, complex sites containing extensive artifact scatters and rock rings, base camps, resource procurement that would include lithic reduction area and plant processing sites. The ranges along the eastern perimeter of the Carson City District provided a corridor for colonization by pinyon woodlands extending from the south through the Paradise Range to the Desatoyas, Clan Alpines, and eventually the Stillwater Ranges. The pinyon groves are gradually younger as one moves northward in the Carson City District, having colonized the Stillwater Mountains within the last 1,500 years or so (Wigan and Novak 1992). At high altitudes it is likely that pine nut procurement sites may be identified as they are a highly valued food resource and finally historic-period resources associated with activities of traditional use of the region by Native Americans. Information obtained during consultation suggests that the Teels Marsh was a traditional gathering and wintering area for three Northern Paiute bands. This would account for the number and variety of site types adjacent to the marsh area. Additional inventories would likely confirm and expand the diversity of site types at this location therefore expectations are high for prehistoric sites within this lease area. Historic borax and salt mining was conducted within the lease area at Teels Marsh and Marietta Districts. The Marietta district is just outside of the northern border of the lease area. Examination of the 1883 GLO maps around the marsh area shows identification of unnamed roads to the north and west of the mining concerns. A few mines were identified on the topographic maps but little information has been documented for these mines or other historic resources. Expectations for historic resources are low to moderate based upon the current review for this lease area.

Rhodes Salt Marsh Lease Area: Twenty six inventories, approximately 1,274 acres of the lease area have been conducted resulting in the identification of approximately 37 cultural resources of both prehistoric and historic site types. During previous surveys conducted in the 1980s expectations were low for prehistoric cultural resources due to the assumed lack of potable water. The final inventories identified many prehistoric sites that were recommended to the National Register (Pendleton et. al, 1982). Although historic sites are present the predominant site type throughout the lease area is prehistoric based upon the small number of inventories (less than 3% of the entire lease area). Groundwater-supported wetlands emerge in a few places such as Rhodes Salt Marsh, and, though once extensive under more mesic conditions, these marshes are isolated and may often be dry. The basins are surrounded by dune fields due to the punctuated input of sediment from flashy alluvial fans emanating from the surrounding dry and sparsely vegetated mountain ranges. Pre-archaic cultural resources have been previously inventoried and are moderate to high within the sand dune formations. Rhodes Salt Marsh was a traditional gathering and wintering area for three Northern Paiute bands (see consultation section). This would account for the number and variety of site types adjacent to the marsh area.

Prehistoric site types that have been previously identified or likely to be identified during future inventories would include but not limited to the following: complex sites containing extensive artifact scatters, base camps, resource procurement that would include lithic quarries and plant processing (high-altitude procurement of pine nuts, a highly valued food resource and various seed plant procurement and processing sites) and historic period resources associated with traditional use of the region by Native Americans.

Historic resources have been identified within the lease area ranging in age from the middle 19th century through the 20th century and are associated with the following activities, mining of borax and salt by the Nevada Salt and Borax Company, Carson and Colorado/ Tonopah and Goldfield Railroad, Sodaville-Tonopah Stage Route, historic refuse and campsites associated with the construction of aforementioned transportation corridors and mining activities. The 1881 and 1894 GLO maps were reviewed and the following were identified in and around the marsh area: roads to Belleville, Columbus, Sodaville, and a road to a wood camp, dwellings, mill and a house in the same vicinity as the Garfield and Arthur Salt and Borax Placer Mines. It is likely that ranching or agricultural endeavors would have occurred with the many ongoing activities and the necessity to provide provisions. The expectations or likelihood of identifying historic resources associated with the aforementioned activities would be low to moderate for this lease area.

Environmental Consequences

Issuing new fluid mineral leases would not result in any direct impacts to cultural resource because no surface disturbing activities would be authorized. Potential direct and indirect impacts from exploration and development activities would be analyzed under a separate site specific environmental analysis.

Based on the results of previous cultural resource inventories, the potential for locating additional cultural resources within the proposed lease areas reviewed for the Proposed Action ranges from low to high. Furthermore, analysis of the reasonably foreseeable impacts of leasing for both identified and unidentified cultural properties resulted in the recommendation of No Historic Properties Affected for all of the lease areas except where the Grimes Point Archaeological Area occupies a portion of the Fallon Lease Area. This is based on the determination that, with the exception of the sections identified, leasing could occur without impact to eligible properties in each of the lease areas.

After consideration of cultural resource information, and other general data including the CRMP (BLM, 2001), the PEIS (BLM and USFS, 2008), and applicable fluid mineral activity NEPA documents, specific data relating to the individual proposed parcels such as topography, vegetation, water and soils, it has been determined that reasonable fluid mineral development could occur without adverse impacts to cultural properties eligible to the NRHP.

The Nevada Protocol Part VII.D. was applied to the cultural resource review for the Proposed Action and the Carson City District determination, under the Nevada Protocol review threshold at VII.D.(1), is that there are no historic properties affected; eligible sites are present but would not be affected as defined by 36 CFR 800.4.

Known cultural resources are located in such a fashion (size, density and placement) that avoidance is feasible during development of fluid mineral resources. The potential for locating additional cultural resources within the six lease areas reviewed for the Proposed Action ranges from low to high. The Fallon, Teels and Rhodes Salt Marsh lease areas are expected to have the highest potential to contain

cultural resources, with the recommended NSO for portions of three sections and all of four sections at the Grimes Point Archaeological Area within the Fallon lease area. Based upon the small percentage of inventory, extensive acreage, previously recorded sites combined with the analysis (water, vegetation, elevation and topography) of Dixie and Edwards Creek and Gabbs lease areas, expectations are high to moderate for unknown cultural resources with the exception of the interior playa of Gabbs Valley which would be low. In the Wabuska Lease Area, expectations are moderate to high for prehistoric and low to moderate for historic cultural resources. A complete inventory of the proposed or anticipated future lease parcels has not occurred; therefore, the following stipulation should be added to lease parcels in the project area:

> *"This lease may be found to contain historic properties and/ or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves and Repatriation Act, E.O. 13007, or other statutes and executive orders. The BLM will not approve any ground disturbing activities that may affect such properties or resources until it completes its obligations under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated."*

3.3 Environmental Justice

As required by NEPA, and specifically in accordance with EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations, federal agencies must incorporate environmental justice as part of their missions. This section addresses topics related to environmental justice, providing specific information on economic, racial, and demographics in and around the area of the Proposed Action to identify low income and high-minority populations.
The following definitions describe low-income and minority population categories discussed in this section:

- Minority: The minority category includes persons who classify themselves as belonging to any of the following racial groups: Hispanic or Latino, Black or African American, American Indian or Alaskan Native, Asian, Native Hawaiian or Other Pacific Islander, and some other race (non-White). The term minority includes all persons classifying themselves in various racial categories, except those identifying themselves as not of Hispanic origin and as White or Other Race (U. S. Census Bureau, 2007).

- Low-Income: The U. S. Census Bureau (2007) determines which families or individuals are poor using a set of money income thresholds, taking into account family size and composition. Those families or individuals that fall below their relevant poverty threshold are considered low income.

Affected Environment

In 2010, the total population in the four counties (Churchill, , Lyon, Mineral and Nye) which occupy all or part of the six proposed lease areas was estimated at 125,575 persons (U.S. Census Bureau – Quick Facts). Of the total population in Mineral County (4,772 persons), 26.7 percent were considered minority, followed by 14.3 percent in Churchill County (total population 24,877 persons), 9.8 percent in Nye County (total population 43,946 persons), and 9.6 percent in Lyon County (total population 51,980 persons). This compares to an estimated 22.9 percent minority population for all of Nevada and a 22.1 percent minority population for the United States of America. With the exception of Mineral County, the

Hispanic population dominated the minority ethnic groups. American Indian is the dominant minority ethnic group in Mineral County owing to the majority of the Walker River Indian Reservation, and the main town of Schurz on that reservation, residing in Mineral County.

In 2010, the poverty (low-income) rate for Nevada was estimated at 14.2 percent, which is less than the National estimate of 14.9 percent. Mineral (23.0 percent) and Nye (20.1 percent) Counties both had estimated poverty rates higher than the Nevada and United States of America average (U.S. Census Bureau – Quick Facts). Lyon (14.3 percent) and Churchill (13.1 percent) Counties had estimated poverty rates below the state and National averages. It should be noted that in 2008 the Nation as a whole had been trending towards a recession which could account for a relative increase the poverty rates Nationwide.

Environmental Consequences
Issuing new fluid mineral leases would not result in direct environmental justice impacts because no surface disturbing activities would be authorized. Potential direct and indirect impacts from exploration and development activities would be analyzed under a separate site-specific environmental analysis.

Indirect impacts to air quality, water quality, noise, cultural resource, geological resource, and hazardous materials resulting from fluid mineral exploration and development could potentially affect minority or low-income populations on private lands adjacent to leasing areas. Potential environmental justice impacts would be avoided through compliance with state and federal regulations, adherence to lease stipulations, and implementation of appropriate BMPs. Appropriate BMPs in this case would be directed at minimizing dust, noise, and other disturbance adjacent to residential areas, schools, or other adjacent urban land uses.

Areas open to potential geothermal leasing may include lands of tribal concern, or having traditional cultural resources or sacred sites. Intergovernmental coordination with affected tribes prior to leasing should limit negative impacts on Native American populations. A narrative describing Native American Religious Concerns associated with the Proposed Action as determined through tribal consultation is presented later in this chapter.

3.4 Floodplains
For NEPA analyses the BLM generally considers the base floodplain as described in the *Floodplain Management Guidelines* for implementing EO 11988 (U.S. Water Resources Council, 1978). The base floodplain is defined as “the lowland and relatively flat areas adjoining inland and coastal waters…, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year.” The base floodplain is similar to the 100-year flood zone commonly shown on maps prepared by the Federal Emergency Management Agency. The guidelines make the base floodplain the minimum area to consider, and floodplain management may include additional flood-prone areas that have significant resource values.

Affected Environment
Some of the proposed lease areas are either within delineated 100-year flood zones, such as portions of the Wabuska and Fallon lease areas, or may be in areas subject to periodic flooding where the flood hazard has not been determined.

Environmental Consequences
Issuing new fluid mineral leases would not result in any direct impacts to floodplains because no surface disturbing activities would be authorized. Potential direct and indirect impacts from exploration and development activities would be analyzed under a separate site-specific environmental analysis.

Surface disturbance adjacent to a floodplain has some potential to adversely affect floodplain function. Potential impacts to floodplains would be minimized through compliance with state and federal regulations, adherence to lease stipulations, and implementation of appropriate BMPs. The Carson City District lease restriction that NSO may occur within 500 feet of any water (BLM [CRMP], 2001) would provide additional protection to floodplains. Water in this case includes water bodies, riparian areas, wetlands and playas; up to and including the 100-year floodplain.

3.5 Invasive, Nonnative Species

Affected Environment
Numerous invasive plant and noxious weed infestations are located on the federal and private lands within the project area. The predominant species in the area of the Proposed Action include salt cedar (*Tamarix ramosissima*), hoary cress (*Cardaria draba*), perennial pepperweed (*Lepidium latifolium*), musk thistle *arduus nutans*), and Russian knapweed (*Acroptilon repens*).

The spread and increase of invasive species in the area of the Proposed Action are contributing factors in the decrease and quantity and/or quality of many of the other renewable resources in the affected environment. Riparian and wetland zones are affected by the spread and increase of invasive plants and noxious weeds. Soils are exposed to erosion as plant communities are converted to unstable invasive plants and noxious weeds. Rangeland grazing potential is reduced as less palatable invasive plants and noxious weeds increase. The protection of threatened and endangered, special status plant and animal species, and their habitat can become increasingly more difficult as invasive plants and noxious weeds spread. Natural and productive vegetation in the form of interactive and interdependent plant communities is lost or converted to less desirable species or communities as invasive plants and noxious weeds spread.

Environmental Consequences
There would be no direct affects to the propagation of invasive, non-native species from issuing new fluid mineral leases alone because leasing does not directly authorize the surface disturbing activities associated with fluid mineral exploration and development. Direct impacts from these activities would be analyzed under a separate site-specific environmental analysis.

The Proposed Action would authorize leasing, which in turn, through site-specific EAs, would authorize roads and drill pad construction. This potential disturbance would be conducive to new infestations and have the potential to increase and spread existing populations of invasive plants and noxious weeds within the area of the Proposed Action. The most likely invader other than early seral stage native weeds would be cheatgrass (Bromus tectorum), halogeton (Halogeton glomeratus), Russian thistle (*Solsola iberica*), hoary cress (*Cardaria draba*), and Russian knapweed (*Acroptilon repens*).

Fluid mineral exploration and development may include staging, construction, maintenance, and the use of motorized vehicles for transportation of personnel and equipment, which may increase the potential for new and expanded infestations. New, continued and enlarged infestations would be minimized through the implementation of appropriate BMPs.

Recommended BMPs (BLM and USFS, 2008) include: (1) the use of certified, weed-free mulch when stabilizing disturbed areas; (2) visually inspect construction equipment arriving at the project area and remove and collect seeds that may be adhering to tires and other equipment surfaces; (3) fill materials and road surfacing materials that originate from areas with known invasive vegetation problems would not be used; (4) revegetation, habitat restoration and weed control activities would be initiated as soon as possible after construction activities are completed; (5) clean all reclamation equipment prior to use to reduce the potential for introduction of noxious weeds or other undesirable non-native species; and, (6) use of pesticides must be approved by the agency.

3.6 Migratory Birds

Affected Environment

On January 11, 2001, President Clinton signed EO 13186 (Land Bird Strategic Project) placing emphasis on conservation and management of migratory birds. Migratory birds are protected under the Migratory Bird Treaty Act (MBTA) of 1918, and the EO addresses the responsibilities of federal agencies to protect them by taking actions to implement the MBTA. BLM management for these species is based on Instruction Memorandum (IM) No. IM 2008-050 dated December 18, 2007.

The Nevada Comprehensive Bird Conservation Plan (2010) and the USFWS' Birds of Conservation Concern (BCC) (2008) were used to determine which avian species known to occur, or could potentially occur, within the six lease areas have been classified as priority species by the USFWS and/or the state of Nevada. The ecological tenet underlying the process is that conservation actions focused on priority species will benefit other avian species that utilize similar habitats.

Key habitats described in the Nevada Wildlife Action Plan (2012) that occurs within the six lease areas, as well as the priority avian species associated with these key habitats, are listed in Table 3 below. More specifically, key habitats include Intermountain cold desert scrub, cliffs and canyons, marshes, and desert playa within the Wabuska Lease Area; Intermountain cold desert scrub, sagebrush, cliffs and canyons, desert playas, and marshes within the Fallon Lease Area; Intermountain cold desert scrub, sagebrush, cliffs and canyons, desert playa, and lower montane woodlands within the Dixie and Edwards Creek Valley Lease Area; Intermountain cold desert scrub, sagebrush, cliffs and canyons, desert playa, and lower montane woodlands within the Gabbs Valley Lease Area; Intermountain cold desert scrub, sagebrush, lower montane woodlands, cliffs and canyons, and desert playa within the Teels Marsh Lease Area; and Intermountain cold desert scrub, sagebrush, lower montane woodlands, cliffs and canyons, and desert playa within the Rhodes Salt Marsh Lease Area. The key habitats occurring within the parcels in the Dixie and Edwards Creek Valley Lease Area that are part of the 2014 sale include lower montane woodlands, sagebrush, Intermountain cold desert scrub, desert playa, and marshes.

Table 3: The Nevada Comprehensive Bird Conservation Plan (2010) and the USFWS' Birds of Conservation Concern (BCC) (2008) priority species that occur, or could potentially occur, within the six lease areas.

Key Habitats	Species	Notes
Desert Playas and Ephemeral Pools/Marshes	American Avocet (*Recurvirostra americana*)	One of the main threats to the species is the dewatering of playas or springs from drought or water diversions (GBBO 2010).
Desert Playas and Ephemeral Pools	Black-Necked Stilt (*Himantopus mexicanus*)	One of the main threats to the species is the dewatering of playas or springs from drought or water diversions (GBBO 2010).
Marshes	Black Tern (*Chlidonias niger*)	One of the main threats to the species is the loss or degradation of marshes due to water diversions, declines in water quality, or development (GBBO 2010).
Intermountain Cold Desert Scrub/Sagebrush	Brewer's Sparrow (*Spizella breweri*)	Though they primarily breed in shrub steppe habitats and are considered to be shrub steppe obligates, they are also associated with salt desert scrub habitats. Nests are usually constructed in the mid to upper canopy of tall, dense sagebrush or greasewood. Insects comprise the majority of the bird's diet in the spring and summer (GBBO 2010, WAPT 2012).
Intermountain Cold Desert Scrub/Sagebrush	Burrowing Owl (*Athene cunicularia*)	Within these habitat types, suitable areas for the owl consists of shrubs spaced far apart or low stature vegetation that allows the bird to see for long distances. Ideal habitats are also closely associated with burrowing animals such as ground squirrels (*Spermophilus* spp.) and badgers (*Taxidea taxus*), as burrowing owls use holes created by these species as nest sites. Prey for burrowing owls consists of small rodents and insects (GBBO 2010, WAPT 2012).
Intermountain Cold Desert Scrub/Sagebrush/Lower Montane Woodlands/Cliffs and Canyons	Ferruginous Hawk (*Buteo regalis*)	Dispersed juniper trees found at the ecotone of pinyon-juniper and desert shrub communities provide ideal nesting trees for ferruginous hawks. The hawk is also commonly observed nesting in cliffs. Ideal ferruginous hawk hunting territory consists of sagebrush communities associated with native grasses and forbs, as these communities generally support a high density of ground squirrels and lagomorphs (GBBO 2010, WAPT 2012).

Key Habitats	Species	Notes
Sagebrush/Intermountain Cold Desert Scrub	Golden Eagle (*Aquila chrysaetos*)	The bird feeds on a variety of small mammals, snakes, birds, juvenile ungulates, and carrion. Nests are generally constructed on rock ledges or in large trees.
Lower Montane Woodlands	Lewis's Woodpecker (*Melanerpes lewis*)	The bird is a cavity nester that uses dead aspen, cottonwood, and pinyon trees. Conserving grasses and shrubs in riparian and aspen habitats, in order to maintain a high density of insects, is important to conserving the species (Neel 1999).
Intermountain Cold Desert Scrub/Lower Montane Woodlands/Sagebrush	Loggerhead Shrike (*Lanius ludovicianus*)	Loggerhead shrikes nest in isolated trees or large shrubs and use scattered, tall shrubs and fences as perches to feed on a variety of prey, which includes small birds, lizards, and mice (Neel 1999).
Marshes	Long-billed Curlew (*Numenius americanus*)	One of the main threats to marshes is the reduction in water availability (WAPT 2012).
Lower Montane Woodlands	Pinyon Jay (*Gymnorhinus cyanocephalus*)	Pinyon jays are known as semi-colonial nesters and pinyon pine woodland obligates (Neel 1999).
Sagebrush/Intermountain Cold Desert Scrub	Prairie Falcon (*Falco mexicanus*)	Nests are generally constructed on the ledges of rocky cliffs, but prairie falcons will also nest in trees utilizing old hawk and raven nests. Prairie falcon populations are strongly correlated with the populations of ground squirrels and other small mammals (GBBO 2010).
Intermountain Cold Desert Scrub/Sagebrush	Sage Sparrow (*Amphispiza belli*)	Preferred habitat includes areas with shrubs at least 45 cm (18 in) tall with 10-25% crown cover mixed with a sparse grass and forb component to provide for insects (Neel 1999, GBBO 2010).
Intermountain Cold Desert Scrub/Sagebrush	Sage Thrasher (*Oreoscoptes montanus*)	Primarily inhabits sagebrush areas, but can be found in salt desert scrub habitat where it integrates with sagebrush. Nests are either constructed in the branches of sagebrush (or occasionally greasewood) or placed underneath the shrub. Insects comprise the majority of a sage thrasher's diet, but the bird will also forage on fruits and berries (GBBO 2010, WAPT 2012).
Desert Playas and Ephemeral Pools	Snowy Plover (*Charadrius alexandrines*)	One of the main threats to the species is the dewatering of playas or springs from drought or water diversions (GBBO 2010).

Key Habitats	Species	Notes
Sagebrush/Lowland Riparian	Swainson's Hawk (*Buteo swainsoni*)	Nesting generally occurs within these habitats from 915-1372 m (3,000-4,500 ft.) in elevation, but individual pairs have been observed nesting at elevations up to 1,829 m (6,000 ft.). Isolated cottonwood trees are generally the preferred nesting tree, but nests located in junipers and aspen have been documented. The primary food sources for the bird are small mammals and large insects (Neel 1999).

The National Audubon Society has established a program of identifying areas of importance for migratory birds. Although Important Bird Areas (IBA) have no legal status or recognition within the official BLM wildlife program, they are useful for planning analysis. Several IBAs are associated with the leasing areas comprising the Proposed Action. The Lahontan Valley Wetlands IBA is located within the Fallon Lease Area. The Walker Lake IBA is not located within the Teels Marsh and Rhodes Salt Marsh Lease Areas; however, the lease areas serve as a stopover and provide corridor habitat for birds that utilize the IBA. The Wabuska Lease Area serves as a stopover for avian species that utilize the Carson River Delta IBA (McIvor 2005).

Environmental Consequences

There would be no direct impacts to migratory bird individuals or populations as a result of the Proposed Action because this leasing action is purely administrative. Additionally, leasing alone does not directly authorize fluid mineral exploration and development activities. Direct impacts from these activities would be analyzed under a separate site-specific environmental analysis. Actions from exploration and development could include groundwater pumping/withdrawal and the construction of roads and power lines. These actions could result in negative impacts to individuals, as well as the loss or fragmentation of habitat; however, identification of the entire range of potential impacts will need to be addressed when site specific information is known.

Potential indirect impacts to migratory birds would be minimized through compliance with state and federal regulations, adherence to lease stipulations, and implementation of appropriate BMPs. Where standard lease terms or BMPs do not provide adequate protection, the BLM would apply seasonal or time limited stipulations or controlled surface use stipulations to leases. Timing limitations are used to protect resources that are sensitive to disturbance during certain periods (BLM and USFS 2008). Such stipulations are generally applicable to specific areas, seasons, and resources, and are commonly applied nesting habitat for migratory birds.

3.7 Native American Religious Concerns

In accordance with the NHPA, NEPA, FLPMA, the American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, and EO 13007, the BLM must provide affected tribes an opportunity to comment and consult on the Proposed Action. The BLM must attempt to limit, reduce, or possibly eliminate any negative impacts to Native American traditional, cultural, or spiritual sites, activities, and resources.

Affected Environment
The following Tribes were notified of the proposed lease sale via certified letter on October 29, 2008 the FPST, WRPT, YPT, YST and TST. The FPST was notified of additional lease parcels on February 25, 2014. The Tribes were asked to identify traditional cultural places or any other areas of traditional cultural importance that need to be considered within the APE. This was followed by both telephone calls and face to face meetings from Carson City District staff. Comments or concerns regarding leasing in the proposed lease areas were submitted to the Carson City District and documented during the consultation process which is ongoing.

The FPST responded concerning previous consultation for the Grimes Point Archaeological Area and the designated NSO at the locations within the current Fallon Lease Area within Township 18 North, Range 30 East, Sections: east ½ of 19, northeast ¼ of 30, northwest ¼ and east ½ of 32 and all of 20, 28, 29, and 33 be designated for the current lease process. The WRPT stated that there were no comments or concerns for the lease, however expectations were that consultation will be ongoing for any future projects that develop as a result of the leasing process. The TST did not have any concerns for the current lease areas. The YPT had some concerns regarding the Wabuska, Teels and Rhodes Salt Marsh lease areas, many of which were discussed previously in the Cultural Resources Section of this EA. The YST has not responded with comments or concerns. All of these Tribes will be contacted with any developments resulting from the leasing process in the future.

Environmental Consequences
Issuing new fluid mineral leases would not result in any direct impacts because no surface disturbing activities would be authorized. Potential direct and indirect impacts from exploration and development activities would be analyzed under a separate site-specific environmental analysis.

Although the act of selling fluid mineral leases does not directly authorize exploration, development, production, or any other related ground disturbance activities, there does exist the potential to impact Native American sites of spiritual, cultural, or traditional nature. Not all sensitive traditional, cultural, or spiritual sites and activities are of a physical nature. Many tribal sacred sites may lack artifacts that would support a past and continued use of the area. The fact that such a site exists and retains its physical integrity and is attached to the continuation of a sacred spiritual belief and/or use, is not to be viewed by non-natives as unimportant. However, impacts to cultural sites can be minimized and/or mitigated when affected Tribes provide input and actively and fully participate in the decision making process.

Without a specific proposed project location and description, identifying impacts to specific tribal resources is difficult. The tribes being given the opportunity to meet with BLM staff and management at the lease sale, exploration, and development stages, would allow for further tribal participation opportunities. As noted previously, the BLM would produce a site specific EA for any future development. Such an EA would discuss alternatives or measures that may reduce or eliminate impacts to Native American Religious Concerns.

3.8 Threatened, Endangered, Proposed, and Candidate Species

Affected Environment

Lahontan Cutthroat Trout

Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*) were listed as endangered by the USFWS on October 13, 1970 (Federal Register Vol.35, p. 16047), then reclassified as threatened in 1975 (Federal Register Vol. 40, p. 29864.) to facilitate management and permit regulated angling. Federal listing for the Lahontan cutthroat trout was warranted in 1970, as the species had experienced major declines throughout its historic range. The historic range, which consisted of the Lahontan basin of northern Nevada, eastern California, Oregon, and Utah, contained an approximate 11 lacustrine populations inhabiting 134,760 ha (334,000 acres) of lakes and an estimated 400-600 fluvial populations occupying greater than 5,800 km (3,600 miles) of stream (USFWS 1995, WAPT 2012). According to Wildlife Action Plan Team (WAPT) (2012), Lahontan cutthroat trout are estimated to occur in 0.4% of their former lake habitat and 11% of their historic stream habitat.

Current threats to Lahontan cutthroat trout and their habitat include hybridization and competition with non-native trout and habitat loss and degradation due to urbanization, mineral development, and over-grazing by livestock (WAPT 2012).

The Fallon Lease Area has the Carson River within its boundaries. The Carson River does support Lahontan cutthroat trout; however, the portion of the river within the Fallon Lease Area is not known to contain the species (USFWS 1995).

There is the potential for Lahontan cutthroat trout to occur within the Dixie and Edwards Creek Lease Area, as Edwards Creek contains the species in its higher reaches. This potential is extremely low, however, as the trout are not known to occur in the portions of the creek that occur within the lease area. Furthermore, only the lower reaches of Edwards Creek occurs within the lease area and the habitat conditions within these lower reaches are generally not suitable to support Lahontan cutthroat trout.

Greater Sage-Grouse

Greater sage-grouse (*Centrocercus urophasianus*) were found to warrant federal listing under the Endangered Species Act on March 23, 2010. Identified threats to greater sage-grouse throughout the species range included habitat conversion and fragmentation from improper grazing practices, wildfire, invasive plants, energy and infrastructure development, and urbanization. In the USFWS's decision to list the greater sage-grouse, the finding was that federal listing would be precluded because other species are in more immediate need for listing (Federal Register Vol.75, p. 13910-14014). Therefore, the greater sage-grouse is currently identified as a Candidate for listing under Section 7 of the Endangered Species Act.

The Dixie and Edwards Creek Lease Area is the only lease area that contains greater sage-grouse habitat. More specifically, both preliminary priority habitat (PPH) and preliminary general habitat (PGH) occurs within the lease area. There are no known leks within the Dixie and Edwards Creek Lease Area, though there are three within four miles of the south eastern portion of the location. PGH occurs within a few parcels that are part of the 2014 sale, though the portions of the parcels that contain PGH have been deferred.

Hiko White River Springfish

Rhodes Salt Marsh Lease Area's eastern boundary is about one mile away from Blue Link Spring, which houses the endangered Hiko White River springfish (*Crenichthys baileyi grandis*). Furthermore, the northeastern corner of this lease area occurs within the same watershed as Blue Link Spring. There are a variety of threats to the Hiko White River springfish that includes the modification of springs through the impoundment, diversion, and piping of spring outflows, activities that result in the loss or significant reduction of aquatic vegetation, and competition with non-native fish and other aquatic species for space and/or food (USFWS, 1985, 1998, 2012).

Environmental Consequences
There would be no direct impacts to federally listed species or habitats occurring as a result of the Proposed Action because the leasing action is purely administrative. Additionally, leasing alone does not directly authorize fluid minerals exploration and development activities. Direct impacts from these activities would be analyzed under a separate site specific environmental analysis and could include impacts to individuals and loss of habitat from actions such as groundwater pumping/withdrawal and the construction of roads and power lines. These potential impacts are not meant to be all inclusive; identification of the entire range of potential impacts would need to be addressed when site specific information is known. Depending on the exact nature of exploration and development, Section 7 consultation may be needed under the Endangered Species Act.

In accordance with BLM IM No. 2002-174, the BLM will apply the following stipulation on any leases where threatened, endangered, or other special status species or critical habitat is known or strongly suspected. Additionally, the BLM will provide a separate notification through a lease notice to prospective lessees identifying the particular special status species that are present on the lease parcel offered.

> "The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or other special status species. BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activities that will contribute to a need to list such a species or their habitat. BLM may require modifications to or disapprove a proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat. BLM will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 USC 1531 et seq., including completion of any required procedure for conference or consultation."

In regards to greater sage-grouse, all parcels containing PPH and PGH, or are within 4 miles of a known lek, are currently being deferred until further notice.

3.9 Wastes, Hazardous or Solid
Laws, Acts, and authorities pertaining to fluid minerals waste include the following: Clean Air Act, Federal Water Pollution Control Act, U.S. Bureau of Alcohol, Tobacco and Firearm (ATF), Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response, Compensation and

Liability Act (CERCLA), Emergency Planning and Community Right-To-Know Act (EPCRA), and the Nevada Administrative Code.

Affected Environment
Hazardous materials, hazardous waste, and solid waste are not normally considered to be part of the natural environment. These items are, rather, the result of human intrusion into the natural environment. This EA is concerned only with hazardous materials, hazardous waste, and solid waste used or generated by exploration and development activities resulting from leasing under the Proposed Action.

Environmental Consequences
There are no direct impacts from issuing leases for future fluid mineral exploration, development, and production activities. The indirect impacts of leasing by exploration, development, and production activities from hazardous materials, hazardous waste, and solid waste, which might be encountered include the following:

Exploration - Indirect leasing impacts from future exploration could include drilling fluid or hydrocarbon spills, leakage from improperly constructed sump pond or wastewater collection systems, improperly handled briny water from drilling, and accumulations of solid waste which could impact water quality or contaminate soils. Hydrocarbon spills could be hydraulic fluid, gasoline, oil, or grease from vehicles, generators, and exploratory drill rigs. Briny water from exploratory drilling, if improperly disposed, could raise the pH of existing surface waters to hazardous levels. Accumulations of nonhazardous waste solids and liquids could include trash, drill cuttings, wastewater, bentonite, and cement generated during drilling operations.

Development - Indirect leasing impacts from future development would be the same as from exploration, but the quantities of hazardous materials, hazardous waste, or solid waste used and generated could be greater. In addition, stormwater runoff could contain elevated quantities of heavy metals and volatile organic compounds. Substantial quantities of non-hazardous solid waste and liquids could be generated at this stage, increasing the potential for contamination of water, soil, and possible toxic impacts to wildlife.

Production - Indirect leasing impacts resulting from future long-term production could include spills and leaks from routine fluid mineral extraction facilities or geothermal power plant operations. Some of the involved materials could be hydraulic fluid, gasoline, oil, paint, antifreeze, cleaning solvents, transformer insulating fluid, binary fluids, and grease; these discharges could result in adverse impacts to water, soil, air, and wildlife. Accidental releases from sumps or wastewater collection systems could include hazardous water-treatment chemicals such as chlorine. Stormwater runoff containing excess heavy metals and volatile organic compounds could be a problem. There would likely be substantial quantities of non-hazardous solid waste generated. Binary geothermal operations could use hazardous materials (such as isobutene or isopentane) which are highly explosive and could have impacts to public safety, and increase the potential for wild fires.

Proper management of these substances according to state and federal regulations would reduce the potential for soil, ground-water, or surface-water contamination, thus minimizing adverse effects to wildlife, worker health and safety, or the surrounding communities. Potential indirect impacts from the storage and handling of solid and hazardous waste would be further minimize through the operator’s adherence to lease stipulations, and implementation of appropriate BMPs.

3.10 Water Quality (Surface/Ground)

Affected Environment

The project area resides within the Great Basin Hydrographic Region. The Great Basin Hydrologic Region in Nevada is an arid region located in the rain-shadow of the Sierra Nevada Mountains. The region is characterized by northerly trending mountain ranges and intermountain valleys with closed drainage. None of the streams that originate within this basin have an outlet to the ocean. The Great Basin's internal drainage results from blockage of water movement by high fault-created mountains and lack of sufficient water flow to merge with larger drainages outside of the Great Basin. The Great Basin Hydrologic Region primarily encompasses basin-fill aquifers (USGS 2002).

This region's surface water sources evaporate or percolate before they can flow to the ocean (USGS 2004). Precipitation generally falls as rain and mountain snowfall. Streams flowing from the mountains carry water to the basins, which infiltrates into the alluvial sediments and provides the only substantial recharge to basin ground water. Surface-water flow in the basins is derived almost entirely from the mountain streams (BLM, 2007b). Any water that falls as rain or snow into this region does not leave except through evaporation or consumption (USGS, 2004).

Apart from major rivers such as the Walker and Carson Rivers proximal to the Wabuska and Fallon lease areas, respectively, surface water flow is intermittent along the mountain fronts and ephemeral in the basins themselves. Surface-water flow in the mountainous areas is limited mainly to late spring snowmelt in the higher areas. Agricultural diversions of major streams emanating from the mountains are common. Diversions from the Carson and Truckee Rivers are used extensively for irrigation within the Fallon Lease Area, while diversion of the Walker River support a portion of the agricultural development proximal to the Wabuska Lease Area.

The water-yielding materials in the Basin and Range aquifers are in valleys and basins, consisting primarily of unconsolidated alluvial-fan deposits. Local floodplain and lacustrine (lake) beach deposits may also yield water to wells. Also, the consolidated bedrock that underlies the unconsolidated alluvium is a water source if sufficiently fractured. Many of these valleys and basins are internally drained where water from precipitation that falls within the basin recharges the aquifer and ultimately evaporates within the basin. Rarely, basins might be hydraulically connected in the subsurface by fractures or solution openings in the underlying bedrock. Also, several basins or valleys may develop surface water drainage that hydraulically connects the basins, and ground water flows between the basins, mostly through the unconsolidated alluvial stream/floodplain sediments (USGS 2002).

The basin-fill aquifers are primarily unconsolidated sand and gravel of Quaternary and Tertiary age. The most permeable basin-fill deposits are present in the depressions created by late Tertiary to Quaternary block faulting and can be classified by origin as alluvial-fan, lake-bed, or fluvial deposits. Other rock types within the region have low permeability and act as boundaries to the flow of fresh groundwater (USGS 2002). The dissolved solids concentrations in the water in the basin-fill aquifers are generally less than 1,000 milligrams per liter.

Ground-water discharge in the area of the Proposed Action is primarily through evapotranspiration (ET). ET varies throughout the area is dependent on several factors such as depth to the water table, elevation, soil type, plant type, or plant density. The United States Geological Survey (USGS) conducted studies that estimated the total ET from bare soil and phreatophytes in the Great Basin. A phreatophyte is a long-rooted plant, such as some varieties of sagebrush, which have adapted to desert or arid

environments by developing a long, deep root system to absorb water from the water table or other permanent ground supply. The average ET rates for phreatophyte areas with less than 20 percent plant cover ranged from 0.13 to 1.60 feet per year (Berger, 2000). Twenty percent or less plant cover can be considered representative of phreatophytic plant density within the area of the Proposed Action. Other discharge of ground water is for consumptive use that includes domestic, municipal, agriculture, and mining.

Shallow ground water in the alluvium of the basins in the area of the Proposed Action is the main source of water for domestic consumption, irrigation, and power plant cooling. Some areas have geothermal reservoirs that underlie the shallow groundwater reservoirs. The Great Basin contains many of the largest groundwater reservoirs in the US. These reservoirs are largely untapped at present, but major urban areas like Las Vegas, Nevada, are actively pursuing their development (BLM, 2007b).

Environmental Consequences
Issuance of a fluid mineral lease within the proposed lease areas would not have an effect on water quality as there is no surface disturbance associated with fluid mineral lease issuance. The indirect impacts of leasing would be realized with the implementation of subsequent exploration and development phases of operation. Direct impacts from these activities would be analyzed under a separate site-specific environmental analysis.

Fluid minerals resources, primarily geothermal, involve the presence and characteristics of available heat and ground water. Ground water is the primary water resource that is potentially affected by fluid mineral exploration and development. Fluid minerals exploration activities could include drilling holes for collection of data such as subsurface temperature gradient data and core for lithology and permeability analysis or for setting explosive charges for seismic analysis. This activity would not be expected to produce large quantities of ground water, geothermal, or oil & gas fluids. Fluids produced during drilling are generally incorporated into the drilling fluid. On completion of drilling, remaining fluids are contained in a mud pit or sump and must be disposed.

Testing and development of the fluid mineral resource would be focused on evaluation of the hydraulic and production character of the fluid mineral reservoir. The testing and development phase is accomplished in open uncased boreholes or cased boreholes (wells). Geophysical techniques and limited pumping (production) of the potential fluid mineral reservoir of oil & gas or geothermal fluids is then implemented in order to evaluate the reservoir. The volume of fluids produced would depend upon the duration of tests performed, which could last from tens of hours to tens of days. Fluid volumes produced during this phase of activity would be small relative to actual production. The production phase of activity would involve the production and disposal of large volumes of produced fluids. Removal of these fluids is not likely to have any discernable impacts, unless there is a hydrologic connection with shallow aquifers and a surface water resource. Disposal options may include reinjection to the source reservoir, evaporation, or release to the land surface.

Determining the indirect environmental impacts of leasing within the project area is difficult. Data describing existing water systems, ground-water reservoirs, oil & gas or geothermal reservoirs and the interrelationships of these systems are inadequate. Potential impacts from exploration and development or production activities to water quality would be evaluated during the site-specific environmental analysis and permitting process. Potential impacts to water quality would then be minimized through compliance with state and federal regulations, adherence to lease stipulations, and implementation of appropriate BMPs which would be incorporated into site-specific permits as COA.

In accordance with recommended BMPs (BLM and USFS, 2008), operators would be required to gain a clear understanding of the local hydrology and would avoid creating hydrologic conduits between aquifers. Operators would also develop a storm water management plan for the site to ensure compliance with applicable regulations and to prevent off-site migration of contaminated water or increased soil erosion. It is expected that these measures, along with the measures outlined to protect soil resources, would effectively minimize impacts on water resources and quality by protecting sensitive surface and ground water resources, protecting wetland and riparian habitats, reducing water quality degradation (i.e., contamination and sedimentation), and meeting applicable water quality standards.

The Carson City District lease restriction that NSO may occur within 500 feet of any water (BLM [CRMP], 2001) would provide additional protection to water quality. Water in this case includes water bodies, riparian areas, wetlands and playas; up to and including the 100-year floodplain. Any leases that contain thermal features (e.g., springs or surface expressions) would have a stipulation requiring monitoring of the thermal features during any exploration, development, and production of the lease to ensure that there are no impacts to water quality or quantity (BLM and USFS, 2008).

Water rights are very specific to individual locations, aquifers, landowners, and local jurisdictions. Fluid minerals developers must obtain the appropriate water rights and state permits, in addition to the Federal lease for the resources.

3.11 Wetlands/Riparian Zones

Wetlands are defined as areas that are inundated or saturated by surface or ground water for periods of time necessary to support hydric soils and aquatic/wetland vegetation such as cattails, sedges, rushes, etc. Riparian areas are distinguished by the presence of vegetation, which is a direct result of access to available water. Riparian areas are defined by a band of green vegetation immediately adjacent to a source of water and are commonly classified into two categories: 1) lotic riparian areas are associated with flowing water (streams and rivers) and 2) lentic riparian areas are related to areas of standing water or moisture (meadows, seeps, or shoreline), also referred to as wetlands. Riparian areas and wetlands are closely related in appearance, function, and attributes. The one distinction between the two classifications is the presence of hydric soils.

Sections 401 and 404 of the Clean Water Act require states to supervise the protection of wetlands and riparian areas. Section 401 requires operators to obtain Water Quality Certification and Stormwater Discharge Permits which are designed to minimize the introduction of pollutants into wetland and riparian ecosystems. Section 404 Compliance is under the jurisdiction of the U.S. Army Corps of Engineers and the USFWS. Section 404 permitting and administration is intended to mitigate problems directly or indirectly associated with projects or actions within or near designated wetlands. In addition to the above regulations, proposed actions or projects must comply with EO 11990 – Protection of Wetlands - which mandates federal agencies to support policies to minimize or prevent the “destruction, loss, or degradation of wetlands”.

Affected Environment

Riparian-wetland areas are the most productive and valuable resources found on federal land in the arid west. Although these areas consist of less than 0.1 percent of the overall landscape in the area of the Proposed Action, a disproportionately large percentage of all desert, shrub, and grassland plants and animals (70 to 80) percent depend on them. These areas play an important role in restoring and

maintaining the chemical, physical, and biological integrity of waters located in the area of the Proposed Action.

Environmental Consequences
There would be no direct impacts from issuing new fluid mineral leases alone because leasing does not directly authorize exploration and development activities. Direct and indirect impacts from these activities would be analyzed under a separate site-specific environmental analysis. Surface disturbance adjacent to wetland/riparian zones has the potential to adversely affect the functioning condition of a riparian area's soil and watershed attributes. Additionally, active exploration and development adjacent to riparian areas would have the potential to disturb and displace wildlife.

It is expected that the indirect impacts to wetland and riparian habitats from the Proposed Action would be minimized through compliance with state and federal regulations, adherence to lease stipulations, and implementation of appropriate BMPs. The Carson City District lease restriction that NSO may occur within 500 feet of any water (BLM [CRMP], 2001) would provide additional protection to wetlands and riparian areas.

3.12 Wilderness
WSAs are roadless area or islands of public land that have been inventoried and found to possess wilderness characteristics as described in Section 603 of FLPMA and Section 2(c) of the Wilderness Act of 1964. Pending Congressional review and official designation or release, such lands are managed according to the Interim Management Policy which preserves the wilderness character. The wilderness areas may be devoted to the public purposes of recreation, scenic, scientific, educational, conservation, and historical use (BLM [CRMP], 2001).

It is BLM policy not to offer any lands for fluid mineral leasing with WSAs. It is Nevada BLM policy to offer and issue fluid mineral leases to within 0.25 mile of a WSA boundary. Any quarter-quarter section intersected by and including a portion of a WSA boundary would be excluded from the parcel nominated (IM No. NV-2004-093). The fact that activities or uses outside of a WSA can be seen or heard from areas within a WSA does not, in and of itself, preclude such activities or uses up to the boundary of a WSA. When fluid mineral exploration, development and production activities on adjacent lands are proposed, the specific impacts of those activities upon the WSA resources and upon public use of the WSA must be addressed and assessed.

Affected Environment
The Dixie and Edwards Creek Valley and Gabbs Valley Lease Areas share a border with the Clan Alpine Mountains and Gabbs Valley Range WSAs, respectively (Figures 4 and 5). The Clan Alpine Mountains WSA is located in Churchill County in west central Nevada. The WSA straddles the northeast trending ridge of the Clan Alpine Mountain Range that separates Dixie Valley to the northwest from Edwards Creek Valley to the southeast. The WSA is thirty miles long and ranges from seven to 15 miles in width. Most of the WSA is highly dissected with over twenty named canyons and dozens of unnamed ones. In general, the area may be characterized as rugged, mountainous and possessing excellent topographic screening. The middle elevations of the WSA afford the best opportunities to experience a sense of seclusion and solitude due to the deeply incised terrain and the excellent vegetative screening.

The Gabbs Valley Range WSA is located in Mineral County, 30 miles east of Hawthorne, Nevada. The WSA contains 79,600 acres of public land which abuts the southern Gabbs Valley leasing area

boundary. The WSA is approximately 16 miles in length from north to south and varies in width from three to 15 miles. The opportunity for solitude is excellent in the center of the WSA around Red Rock Canyon due to the presence of ridges and pinyon-juniper that isolate visitors from the human developments found around the edge of the area. The rugged terrain and relatively limited amount of water found in the area pose challenges to recreational visitors.

Environmental Consequences

There would be no direct impacts from issuing new fluid mineral leases alone because leasing does not directly authorize exploration and development activities. There would also be no direct impacts from these activities because fluid mineral leasing is not allowed within WSAs. Although exploration and development activities could be conducted up to the boundary of the WSA and would not be precluded because they can be seen or heard from areas within a WSA, site-specific environmental assessments would be required before any action was undertaken and indirect impacts to WSAs would be assessed. Impacts to WSAs would then be minimized through compliance with state and federal regulations, adherence to lease stipulations, and implementation of appropriate BMPs which would be incorporated into site-specific permits as COA.

3.13 Land Use

The BLM manages public lands under the authority of FLPMA. FLPMA provides direction for land use planning, administration, access and transportation, range management, rights-of-way, designated management areas (including specific locations and general designation of wilderness areas), and effects on existing rights. The BLM is responsible for carrying out a variety of programs for the management and conservation of resources on 258 million surface acres, as well as 700 million acres of subsurface mineral estate. These surface acres comprise about 13 percent of the total US land surface.

Land use authorizations include various authorizations and agreements to use BLM-administered land, such as right-of-way grants, road use agreements, and land use permits. Land use authorizations are issued for a variety of purposes, both short and long term. Short-term uses include commercial filming, construction equipment storage sites, and other uses involving minimal land improvements or disturbances. Long-term uses include rights-of way grants for power lines, highways, roads, pipelines, fiber optics, communication sites, electric power generation sites, irrigation works and other facilities.

No right-of-ways are required for “on lease” activities by a fluid mineral lease holder. A fluid mineral lessee must acquire authorized FLPMA right-of-ways for “off lease” activities, such as access road construction to the lease area for other facilities. The Application for Permit to Drill (APD) for oil & gas or Geothermal Drilling Permit may serve as the supporting document for the off lease right-of-way plan of development; however, the appropriate NEPA analysis for off-site developments would be required and site-specific stipulations would be determined. Third party facilities, such as pipelines or power lines not owned by the lessee, would require a FLPMA right-of-way across a lease.

Affected Environment

The fluid mineral lease areas encompass more than one-million acres of federal and private land throughout the west-central part of Nevada. In general, federal lands occupy roughly half of the Wabuska and Fallon lease areas, while the remaining lease areas are comprised almost entirely of federal land. BLM is the primary surface management agency for federal lands in the Wabuska, Dixie and Edwards Creek Valley, Gabbs, Teels Marsh, and Rhodes Salt Marsh Lease Areas. The BOR is the primary surface management agency for federal lands in the Fallon Lease Area. The Fallon Lease Area also encompasses a portion of the Fallon Naval Air Station. The Dixie and Edwards Creek Valley Lease

Area contains a portion of the Dixie Valley Training Area which is managed by the military. The BLM does not track the acres of split (surface/mineral) estate; however, of the lands under private ownership in the project area, only a very small percentage is split estate. Approximately 400 acres of public lands within the Wabuska area have been identified through BLM land use planning for potential disposal from federal ownership.

There are a variety of land use authorizations within the area of the Proposed Action, including numerous BLM permitted rights-of-way. Many of these authorizations are non-exclusive to the holder. In other words, under the principals of "multiple use" as mandated by FLPMA, other uses of the land such as mining, grazing, recreation or fluid minerals leasing are allowed.

Environmental Consequences
Leasing creates a valid existing right, which could conflict with other existing or future land use authorizations and could impact sale or other conveyance of lands currently designated for disposal from federal ownership. It is anticipated that portions of some lease parcels would be proposed for roads during fluid minerals exploration, development and processing. On lease activities such as this would be subject to site-specific NEPA analysis. Off-lease right-of-way applications and grants would also be anticipated for pipelines and power lines in support of fluid mineral developments. These off-lease right-of-ways would be nonexclusive where possible; that is, they can be used by the general public for other purposes such as access to public lands and would also be subject to the appropriate site-specific NEPA analysis.

FLPMA requires that prior existing rights must be recognized, so fluid mineral development would be designed to avoid or minimize impacts to existing authorized uses or facilities. Through appropriate coordination with authorized land use holders, physical disturbances or temporary disruptions in use may acceptable.

Exploration on split estate lands would require reasonable compensation to surface owners according to the regulations found at 43 CFR 3814, which implement the Stockraising Homestead Act of 1916. Such compensation may impact the economics of an exploration program to the point where exploration cannot occur.

Areas of intense fluid mineral development and production create prior existing rights for the lessees and could affect the direction or placement of future non fluid mineral related right-of-ways.

3.14 Recreation
A wide variety of outdoor recreation activities occur on BLM administered lands. Some of the more popular activities include sightseeing, pleasure driving, rock collecting, photography, water sports, winter sports, off-highway vehicle use, rock climbing, mountain biking, picnicking, camping, hunting, and hiking.

This wide range of opportunities is possible because virtually all of the public lands are accessible and offer a variety of settings suitable for different recreational activities. Some of these activities may occur on potential fluid mineral leases but in general, are not affected by fluid mineral development. The desert playas and mountains within the Proposed Area provide the resources for a variety of recreational experiences including natural beauty, solitude, and freedom from the structure of regulations of urban areas. Scenic values are often cited as an important element for the participant's recreational experience.

Affected Environment
The lease areas are primarily located on desert playa and surrounding terrain which provides limited recreational opportunities which are generally dispersed in nature and include Off-highway Vehicle (OHV) riding, target shooting, equestrian use and backcountry camping. The Grimes Point Archeological Area is a high use area within the Fallon Lease Area and consists of hiking trails around culturally significant sites. In addition to trail riding, the proposed Gabbs Valley Lease Area also has several OHV permitted events annually.

Environmental Consequences
Issuing new leases within the project area does not involve ground disturbance, or changes in population or human occupation levels. Therefore, there are no direct impacts to current recreational opportunities.

Implementation of the Proposed Action could potentially result in the development of fluid mineral resources within the lease areas in the future. Development in any of the areas could have an impact on the quality of natural landscape through the creation of new roads which in turn could result in an increase to public land access. Indirect impacts from future actions such as oil and gas exploration or development resulting from the Proposed Action could occur but these activities would be analyzed under their own site-specific NEPA analysis.

3.15 Visual Resources
The BLM initiated visual resources management (VRM) by establishing VRM class designations during planning processes to manage the quality of the landscape and minimize potential impacts to visual resources resulting from development activities. The first step in determining VRM class objectives for an area is the completion of the visual resource inventory (VRI). This process, which considers the scenic value of the landscape, viewer sensitivity to the scenery, and the distance of the viewer to the subject landscape, is completed using the BLM's Visual Contrast Rating System outlined in BLM Visual Resource Management Inventory and Contrast Rating Manuals 8410-1 and 5432-1.1. By using this system, the impact magnitude to visual resources can be measured by separating the landscape into its major features (landform, vegetation and structures) and predicting the magnitude of change to each of the basic visual elements (line, form, color and texture) within each of the features. Visual analyses for proposed projects are conducted using Key Observation Points, which are locations from which a proposed project can be seen.

The resulting VRI class designations are then combined with the management objectives for the area to assign one of four VRM Class objectives. These management classes identify various permissible levels of landscape alteration, while protecting the overall visual resources of the region. Management classes are divided into four levels (Classes I, II, III, and IV), with Class I designated as most protective of the visual resources. The objectives of these classes vary from very limited management activity to activity that allows major landscape modifications and are shown below in Table 4.

Table 4: VRM Class Objectives

Class	Description
I	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the landscape should be very low and must not attract attention.
II	The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Class	Description
III	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
IV	The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance and repeating the basic landscape elements.

Management classes are utilized to identify minimum levels of allowable disturbance to the visual resource when a proposed development action is analyzed using the BLM's Visual Contrast Rating System outlined in BLM VRM Inventory and Contrast Rating Manuals 8410-1 and 5432-1.1. By using this system, the impact magnitude to visual resources can be measured by separating the landscape into its major features (landform, vegetation and structures) and predicting the magnitude of change to each of the basic visual elements (line, form, color and texture) within each of the features. Visual analyses for proposed projects are conducted using Key Observation Points, which are locations from which a proposed project can be seen.

Once potential impacts to visual resources have been identified for each location, visual design considerations are incorporated into the proposed surface-disturbing projects on a case-by-case basis. Mitigation measures, using the following design techniques, are developed for each site to minimize adverse impacts to visual resources and to maintain the appropriate VRM class:

- Site locations to minimize adverse effects.
- Minimize disturbance during construction.
- Repeat form, line, texture and color in the design elements.
- Utilize appropriate color selection for exterior building materials.
- Implement sensitive grading methods to minimize variations in natural topography.
- Apply appropriate reclamation and restoration methods during project closure.
- Emphasize linear alignment in design.

Affected Environment

The project area is located in the Basin and Range physiographic province. Basin and range landscapes in central Nevada are characterized by elongated, generally north-trending mountain ranges separated by broad, open basins. This type of landscape allows for long viewing distances.

The dominant natural features within the area of the Proposed Action include steep rugged mountains; expansive valleys and playas; dune fields; hot and cold springs; streams and rivers; and associated floodplains and marshes. Human-made features include ranges, fences, irrigated and cultivated fields, power lines, utility corridors, several state and US highways, other gravel and native surface secondary roads, two-track jeep and off-highway vehicle trails, the Pony Express National Historic Trail (NHT), large open pit mines, gravel pits, small dams and reservoirs, telecommunication towers and associated buildings.

A large portion of the area of the Proposed Action (with the exception of the Fallon lease area) is located in relatively large expansive valleys away from populated areas. These areas all have scattered ranches and farms in large valleys surrounded by relatively steep mountains. Ranch settings typically include small dwellings, outbuildings, barns, fences, trees, corrals and fields. They are all situated on private

lands, and only the larger features are visible form a great distance. Newer buildings painted with light colors contrast with background landscapes. The ranches have been in existence for many years, and the majority of the structures tend to be weathered, blending in with the surroundings. Access roads are also present in the valleys.

Environmental Consequences
There would be no direct impacts from issuing new fluid mineral leases alone because leasing does not directly authorize exploration and development activities. Direct impacts from these activities would be analyzed under a separate site-specific environmental analysis.

Currently, the proposed lease area does not have VRM Class designation though this action is being undertaken in the current Resource Management Plan revision. According to BLM policy, interim VRM classes can be adopted for areas with proposed projects if no VRM designation exists. Based upon the visual resource inventory completed for the area in 2011 and management objectives for lands within the confines of the six leases, the lands would be assigned either a VRM Class III or IV designation. The management objective for Class III and IV would be compatible with energy development projects.

The following are potential environmental impacts on visual resources that could occur with fluid mineral development.

Exploration - Direct impacts to the landform, vegetation, and structural features of the characteristic landscape could occur during the exploration phase; however, these effects would usually be of short duration and localized to a small area. Drilling would temporarily impact the landscape by introducing new line, color, form and texture elements into the landscape. Brightly colored drill rigs and supporting facilities would be visible to visitors. Disturbances to vegetation from drilling and seismic operations could be seen for longer periods of time.

Production/Development - During the development phase, construction of roads, drill pads, pipelines, tank batteries and power lines would result in long term modification to the line, form color, and texture of the characteristic landscape. Roads, pipelines and power lines create strong horizontal linear contrasts. Vegetation and soil removal create color, textural, and linear contrasts with adjacent areas that could be highly visible long after drilling and development facilities were removed. Constructed features would have strong geometric and linear shapes, as well as solid colors, all contrasting with the natural landscapes and continuing throughout the life of the project.

Final Abandonment/Close Out - When the project is completely shut down and reclaimed, modified landscapes would be rehabilitated, and the visual impacts would diminish with time. It can take many years for disturbed areas to return to a natural appearance. If the project is not completely shut down, the impacts could continue indefinitely.

Potential indirect impacts from the Proposed Action to visual resources from long-term developments and facilities such as access roads and drill pads would be mitigated on a case-by-case basis through the implementation of appropriate BMPs. In accordance with recommended BMPs (BLM and USFS, 2008), operators would incorporate visual design considerations into the planning and design of the project to minimize potential visual impacts and to meet the VRM objectives of the area and the agency.

3.16 Wild Horses and Burros

The primary responsibilities of the BLM under the Wild Free-Roaming Horse and Burro Act of 1971 are to preserve and protect wild horses and burros and to manage for healthy rangelands (BLM, 2002a). Under the Act, the BLM was directed to identify herd areas where horses and burros were located. The BLM inventoried and mapped these herd areas in the first few years following passage of the act. Through the BLM planning process, areas where wild horses are managed as a component of the public lands are designated as herd management areas (HMAs).

Affected Environment

The BLM manages wild horses and burros in HMAs, and there are approximately 103 HMAs in Nevada. In addition to HMAs, the Marietta Wild Burro Range southeast of Hawthorne, Nevada, is the nation's only formally recognized wild burro range. It was dedicated in 1991, contains approximately 85 burros, and covers 68,000 acres. The Carson City District manages 15 HMAs, and all but one of which, the Marietta Wild Burro Range, is for horses. The HMAs are scattered throughout the field office. Portions of the Augusta Mountains, New Pass, Clan Alpine, Pilot Mountain, Garfield Flat and Marietta Wild Burro Range HMAs overlie the project area (see Figures 4, 6 and 7).

Environmental Consequences

There are no direct impacts to issuing leases for future fluid mineral exploration, development, and production activities. Wild horses and burros could be affected by fluid mineral resource development within each lease area. Any effects would vary with each site, and would be assessed in site-specific EAs prepared for development of individual leases.

Indirect impacts from noise or surface disturbance associated with the Proposed Action could influence herd distribution and migration within and between the HMAs, and cause disturbance to forage resources. Horses and burros would likely shift their movements to avoid disturbances, thus causing impacts to other areas within the HMA. The relative impacts would be greater to smaller HMAs with limited areas of forage and water availability.

The potential for indirect impacts to horse and burro population would be minimized through compliance with state and federal regulations, adherence to lease stipulations, and implementation of appropriate BMPs. Recommended BMPs (BLM and USFS, 2008) include:

- The operator would ensure employees, contractors, and site visitors avoid harassment and disturbance of wild horses and burros, especially during reproductive (e.g., breeding and birthing) seasons. In addition, any pets will be controlled to avoid harassment and disturbance of wild horses and burros.

- Operators would gain a clear understanding of the local hydrogeology. Areas of groundwater discharge and recharge and their potential relationships with surface water bodies would be identified.

- Ponds, tanks and impoundments containing harmful liquids should be excluded from wildlife access by fencing, netting or covering at all times when not in active use.

- Observations of potential problems regarding wild horses or burros, including animal mortality, would be immediately reported to the agency.

3.17 Soils

Affected Environment

The soils within the proposed lease areas vary considerably in physical, chemical, and biological characteristics. Parent material, surface and subsurface textures and rock fragments, elevation, aspect, and slope determine the inherent productivity. Erosion and runoff potential, while affected greatly by these factors, are also dependent upon the basal and canopy cover of vegetation on site. Also, roads, livestock and horse use, mining and other overland activities, and general motorized vehicle use have impacted soils in certain areas. Generally the soils in the respective lease areas are classified as aridisols or entisols; or mollisols at higher elevations. The lease areas fall within several precipitation zones ranging from 4 to 12 inches per year. Soil reactions range from neutral or slightly alkaline to strongly alkaline. Detailed descriptions of the soils within the respective leasing areas can be found within the various County Soil Surveys, issued by the U.S. Dept. of Agriculture-Natural Resource Conservation Service.

Environmental Consequences

Issuing new fluid mineral leases would not result in any direct impacts to soils because no surface disturbing activities would be authorized. Potential direct and indirect impacts from exploration and development activities resulting from the issuance of new leases would be analyzed under a separate site-specific environmental analysis.

Potential indirect impacts from the Proposed Action would occur to soil resources during fluid mineral exploration and development. These activities may include the clearing of soil from roadways, staging areas, construction sites and maintenance areas, which may result in some soil loss. The potential for indirect impacts to soils would be minimized through compliance with state and federal regulations, adherence to lease stipulations, and implementation of appropriate BMPs.

The recommended stipulation that NSO may occur on slopes in excess of 40 percent and/or soils with high erosion potential (BLM and USFS, 2008) would provide additional protection to soil resources. Potential indirect impacts to soil resources in association with the Proposed Action would be further minimized through the implementation of appropriate BMPs. Recommended BMPs (BLM and USFS, 2008) include:

- Operations would disturb the minimum amount of surface area necessary to conduct safe and efficient operations. When possible, equipment would be stored and operated on top of vegetated ground to minimize surface disturbance.

- In areas to be heavily disturbed, the top [eight (8)] inches of soil material, would be stripped and stockpiled around the perimeter of the well location to control run-on and run-off, and to make redistribution of topsoil more efficient during interim reclamation. Stockpiled topsoil may include vegetative material. Topsoil would be clearly segregated and stored separately from subsoils.

- Earthwork for interim and final reclamation would be completed within 6 months of well completion or plugging unless a delay is approved in writing by the BLM authorized officer.

- Salvaging and spreading topsoil would not be performed when the ground or topsoil is frozen or too wet to adequately support construction equipment. If such equipment creates ruts in excess of four (4) inches deep, the soil would be deemed too wet.

- No major depressions would be left that would trap water and cause ponding.

3.18 Minerals

Affected Environment

There are no mining operations authorized in any of the proposed lease areas However, several unpatented mining claims do exist in portions of some of the lease areas, and fluid mineral leases would be subject to valid existing rights. There are numerous Nevada Department of Transportation (NDOT) mineral material sites within the project area along main and alternate routes of U.S. highways 50 and 95, as well as state routes 121 and 361.

Environmental Consequences

Issuing new fluid mineral leases would not result in any direct impacts to minerals because no surface disturbing activities would be authorized. Potential direct and indirect impacts from exploration and development activities resulting from the issuance of new leases would be analyzed under a separate site-specific environmental analysis.

There is the potential for future conflict between fluid mineral exploration and development and any locatable mining claim activities which may be proposed on lease parcels during the same time period. Neither lease holders nor mineral claimants may proceed with operations on leased or claimed public lands without notice to the BLM. Should operations be proposed which would result in potential conflict between the two parties, the BLM would attempt to assist the two parties to reduce or eliminate conflict.

3.19 Livestock Grazing

The primary laws that govern grazing on public lands are the Taylor Grazing Act of 1934, FLPMA, and Public Rangelands Improvement Act of 1978. The Taylor Grazing Act directs that occupation and use of the range be regulated to preserve the land and its resources from destruction or unnecessary injury, and to provide for the orderly use, improvement, and development of the range. FLPMA provides authority and direction for managing federal lands on the basis of multiple use and sustained yield and mandates land use planning principles and procedures for federal lands. The Public Rangelands Improvement Act does the following:

- Defines rangelands as public lands on which there is domestic livestock grazing or that are suitable for livestock grazing;

- Establishes a national policy to improve the condition of public rangelands so they will become as productive as feasible for all rangeland values;

- Requires a national inventory of public rangeland conditions and trends; and

- Authorizes funding for range improvement projects.

The BLM manages rangelands on public lands under 43 CFR Part 4100 and BLM Handbooks 4100 to 4180. The BLM conducts grazing management practices through BLM Manual H-4120- 1 (BLM 1984). Under this management, ranchers may obtain a grazing permit for an allotment of public land on which a specified number of livestock may graze. An allotment is an area of land designated and managed for livestock grazing. The number of permitted livestock on a particular allotment on public land is determined by how many animal unit months (AUMs) that land will support. An animal unit month is

the quantity of forage required by one mature cow and her calf (or the equivalent in sheep or horses) for one month.

Affected Environment
Livestock production is a major industry within the Carson City District administrative boundary. There are 16 grazing allotments within or overlapping the project area. The grazing allotments are comprised of both public and private lands. A full AUM fee is charged for each month of grazing by adult animals based on the following: 1) the grazing animal is weaned; 2) is six months of age or older when entering public land; or 3) would become 12 months of age during the period of use. The grazing allotments operations consist of a mixture of cattle, sheep, and horses.

Environmental Consequences
There would be no direct impacts from issuing new fluid mineral leases alone because leasing does not directly authorize fluid mineral exploration and development activities. Direct impacts from these activities would be analyzed under a separate site-specific environmental analysis.

The indirect impacts from the Proposed Action would include disturbance from seismic lines, exploration and thermal gradient wells, road construction, gravel pit expansions, as well as land disturbance for fluid mineral production. The removal of vegetation would temporarily decrease the amount of available forage for livestock. This may reduce the AUM number, thus decreasing the amount of livestock that could forage within the allotment. The potential decrease in livestock would coincide with the area of disturbance. Exploration activities could also have a temporary effect on grazing patterns by shifting and/or intensifying livestock grazing over other areas.

These potential impacts are not meant to be all inclusive; identification of the entire range of potential impacts would need to be addressed when site specific information was known. At that time, potential indirect impacts to livestock and grazing would be minimized through compliance with state and federal regulations, adherence to lease stipulations, and implementation of appropriate BMPs. In accordance with recommended BMPs (BLM and USFS, 2008), the operator would coordinate with livestock operators to minimize impacts to livestock operations.

3.20 General Wildlife
Affected Environment
General Wildlife & Fisheries: A variety of key habitats described in the Nevada Wildlife Action Plan (2012) occur within the six lease areas. More specifically, key habitats include Intermountain cold desert scrub, cliffs and canyons, marshes, and desert playa within the Wabuska Lease Area; Intermountain cold desert scrub, sagebrush, cliffs and canyons, desert playas, and marshes within the Fallon Lease Area; Intermountain cold desert scrub, sagebrush, cliffs and canyons, desert playa, and lower montane woodlands within the Dixie and Edwards Creek Valley Lease Area; Intermountain cold desert scrub, sagebrush, cliffs and canyons, desert playa, and lower montane woodlands within the Gabbs Valley Lease Area; Intermountain cold desert scrub, sagebrush, lower montane woodlands, cliffs and canyons, and desert playa within the Teels Marsh Lease Area; and Intermountain cold desert scrub, sagebrush, lower montane woodlands, cliffs and canyons, and desert playa within the Rhodes Salt Marsh Lease Area. The key habitats occurring within the parcels in the Dixie and Edwards Creek Valley Lease Area that are part of the 2014 sale include lower montane woodlands, sagebrush, Intermountain cold desert scrub, desert playa, and marshes. A brief description of the key habitat types, as well as some wildlife and vegetative species associated with these key habitat types, are described below.

Intermountain Cold Desert Scrub: Plant communities within this key habitat are generally composed of a variety of salt-tolerant shrubs from the Chenopodiaceae family. More specifically, common species within this habitat type include fourwing saltbush (*Atriplex canescens*), spiny hopsage (*Grayia spinosa*), shadscale (*Atriplex confertifolia*), and greasewood (*Sarcobatus vermiculatus*). Wildlife associated with this habitat type includes pronghorn (*Antilocapra americana*), pale kangaroo mice (*Microdipodops pallidus*), long-nosed leopard lizards (*Gambelia wislizenii*), Great Basin collared lizards (*Crotaphytus bicinctores*), Brewer's sparrows, and black-throated sparrows (*Amphispiza bilineata*) (WAPT 2012).

Sagebrush: Plant species within this key habitat include Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), basin big sagebrush (*A.t.* ssp. *tridentata*), low sagebrush (*A. arbuscula* ssp. *arbuscula*), black sagebrush (*A. Nova*), Douglas rabbitbrush (*Chrysothamnus viscidiflorus*), Great Basin wildrye (*Leymus cinereus*), Indian ricegrass (*Achnatherum hymenoides*), and globemallow (*Sphaeralcea coccinea*). Greater sage-grouse, Brewer's sparrow, sage sparrow, pygmy rabbit, and mule deer (*Odocoileus hemionus*) are species associated with this habitat type.

Lower Montane Woodlands: Utah juniper (*Juniperus osteosperma*) and single-leaf pinyon pine (*Pinus monophylla*) are the primary vegetative species in some upper elevations of the lease areas. Some mountain big sagebrush (*A.t.* ssp. *vaseyana*), Ephedra sp, Sandberg bluegrass (*Poa secunda*), and phlox (*Phlox* spp.) can be found in the understory. All of these are key forage species for big game. Wildlife such as pinyon jays, mountain chickadees (*Poecile gambeli*), sharp-shinned hawks (*Accipiter striatus*), and mule deer can be found in this habitat type.

Springs and Springbrooks: Both spring and springbrooks can be found within every proposed lease area. These areas general have some form of riparian vegetation associated with them. While the actual amount of riparian/spring habitat is small in Nevada (<5%), the spring and springbrook key habitat provides habitat for 165 of Nevada's 173 endemic species (Nevada Wildlife Action Plan Team 2012).

Marsh: Marshes are associated with soils that remain moist or saturated most of the year. Vegetation, which often includes cattails, bulrush, and a variety of sedges, is dictated by water levels and salinity. American Avocets (*Recurvirostra americana*), northern leopard frogs (*Rana pipiens*), and vole species are wildlife that can be found in this habitat type.

Desert Playas: This habitat type experiences intermittent flooding and evaporation that precipitates fine soils and mineral salts. The area surrounding the playa generally has fresher soils and supports four-winged saltbush, saltgrass (*Distichlis spicata*), and pickleweed. This habitat is especially important to snowy plover and several other avian species that use the mud flats for winter habitat, reproduction and foraging. Desert playas can also function as stopover habitat for some shorebird species. Bats use inundated areas of desert playas for foraging.

Sand Dunes and Badlands: These areas include bedrock outcrops, Aeolian deposits and other areas dominated by substrate rather than vegetation. Stable sand dunes can support rich stands of ricegrass and native sunflowers and other unique forbs such as Lahontan beardtongue. Representative wildlife species associated with this type include kangaroo rat and mouse sp., kit fox (*Vulpes macrotis*), and desert horned lizard (*Phrynosoma platyrhinos*).

Game Species

Mule deer can be found in and around portions of each of the lease areas. Within the Wabuska and Fallon Lease Areas, mule deer are found within and around agricultural areas. A small portion of mule deer crucial winter range and year-round habitat occurs along the eastern and northeastern boundaries of the Gabbs Lease Area. Within the Excelsior Mountains in the Teels Lease Area, mule deer crucial winter range occurs in the northwestern portion of the lease area and winter range occurs in the northern part of the lease area. Mule deer year-round habitat occurs within the Rhodes Salt Marsh Lease Area in the Pilot Mountains. Within the Dixie Valley and Edwards Creek Lease Area, the sections within the Stillwater Range and Clan Alpine Mountains contain year-round habitat, and the sections within the Desatoya Mountains contain year-round and crucial summer habitat. In regards to the sections within the Dixie Valley and Edwards Creek Lease Area that are proposed for the 2014 sale, the sections within the Stillwater Range are classified as year-round habitat.

Because several of the lease areas have key mule deer areas, particularly winter ranges near or on the project areas, there would also be mountain lions in these areas. Numbers would generally cycle with mule deer numbers. Lions would be expected to cross all of the lease areas while travelling from one mountain range to another.

Historically, pronghorn were present in all valleys of Nevada (BLM 1988). No pronghorn habitat has been identified by NDOW within the Fallon Lease Area. Within the Wabuska Lease Area, pronghorn year-round habitat occurs within the western portion of the location. Within the Gabbs, Teels, Rhodes Salt Marsh, and Dixie and Edwards Creek Lease Areas, pronghorn year-round habitat occurs either throughout or in the vast majority of these locations. Pronghorn year-round habitat occurs throughout the parcels within the Dixie and Edwards Creek Lease Area that are part of the 2014 sale.

Several of the lease areas have occupied desert bighorn sheep (*Ovis Canadensis Nelsoni*) range within the boundary or adjacent to a boundary. More specifically, year-round bighorn habitat occurs within the Teels Lease Area in the Excelsior Mountains, within the Rhodes Salt Marsh Lease Area in the Pilot Mountains, within the Gabbs Lease Area in the Monte Cristo Mountains, and within and immediately adjacent to the Dixie and Edwards Creek Lease Area in the Stillwater Range, Clan Alpine Mountains, and Desatoya Mountains. The parcels part of the 2014 sale in the Stillwater Range within the Dixie and Edwards Creek Lease Area are classified as bighorn sheep year-round habitat. Bighorn sheep lambing habitat occurs within portions of the northernmost sections of the Gabbs Lease Area.

The Teels Lease Area has occupied black bear habitat in the northwest portion of the lease area that is associated with the Excelsior Range (NDOW 2005). No other lease areas contain black bear habitat.

Potential elk habitat has been identified in the Clan Alpine Range associated with the Dixie and Edwards Creek Lease Area (NDOW, 2006). Elk sightings have been made in the northern end of the Clan Alpine Range. Elk from the Humboldt-Toiyabe Forest to the east are likely pioneering the Clan Alpine Range. These animals would likely use the Mt. August / New Pass areas seasonally as they pioneer.

A few mourning doves can be found in the lease areas but free water would limit their use (BLM 1995). Mountain quail would be found at higher elevations. California quail would be found in lower elevations. The exotic species chukar partridge can be found in some of the lease areas.

Environmental Consequences

General Wildlife & Fisheries:

There would be no direct impacts to general wildlife and fisheries as a result of the Proposed Action because this leasing action is purely administrative. Additionally, leasing alone does not directly authorize fluid mineral exploration and development activities. Direct impacts from these activities would be analyzed under a separate site-specific environmental analysis. Actions from exploration and development could include groundwater pumping/withdrawal and the construction of roads and power lines. These actions could result in negative impacts to individuals, as well as the loss or fragmentation of habitat; however, identification of the entire range of potential impacts will need to be addressed when site specific information is known.

Game Species: There would be no direct impacts to game individuals or populations as a result of the Proposed Action because this leasing action is purely administrative. Additionally, leasing alone does not directly authorize fluid minerals exploration and development activities. Direct impacts from these activities would be analyzed under a separate site specific environmental analysis. Impacts from exploration and development could include the direct loss of habitat and habitat fragmentation from actions such as road and power line development. These potential impacts are not meant to be all inclusive; identification of the entire range of potential impacts would need to be addressed when site specific information is known.

Potential indirect impacts to big game species would be minimized through adherence to lease stipulations and implementation of appropriate BMPs. Where standard lease terms or BMPs do not provide adequate protection, the BLM would apply seasonal or time limited stipulations or controlled surface use stipulations to leases. Timing limitations are used to protect resources that are sensitive to disturbance during certain periods.

3.21 BLM Sensitive Species

Affected Environment

BLM Sensitive Species: BLM Manual 6840 defines sensitive species as "…those species not already included as BLM Special Status Species under (1) Federal listed, proposed or candidate species; or (2) State of Nevada listed species. Native species may be listed as "sensitive" if it: (1) could become endangered or extirpated from a state or significant portion of its range; (2) is under review by the FWS/NMFS; or (3) whose numbers or habitat capability are declining so rapidly that Federal listing may become necessary, or (4) has typically small and widely dispersed populations; (5) inhabits ecological refugia, specialized or unique habitats; (6) is state-listed, but is better conserved through application of the BLM sensitive species status." It is BLM policy to provide sensitive species with the same level of protection that is given federal candidate species. The major objective of this protection is to preclude the need for federal listing.

A list of BLM sensitive species that are known, or could potentially occur, within the lease areas is provided in Table 5 below. The complete sensitive species list for the Carson City District is provided for in Appendix E.

Table 5: BLM Nevada sensitive species that occur, or could potentially occur, within the Wabuska, Fallon, Gabbs, Teels, Rhodes Salt Marsh, or Dixie and Edwards Creek Lease Areas.

Key Habitats	Species	Notes
	Avian	
Intermountain Cold Desert Scrub/Sagebrush	Brewer's Sparrow	Habitat described in the Migratory Birds Section.
Intermountain Cold Desert Scrub/Sagebrush	Burrowing Owl	Habitat described in the Migratory Birds Section.
Intermountain Cold Desert Scrub/Sagebrush/Lower Montane Woodlands/Cliffs and Canyons	Ferruginous Hawk	Habitat described in the Migratory Birds Section.
Sagebrush/Intermountain Cold Desert Scrub	Golden Eagle	Habitat described in the Migratory Birds Section.
Lower Montane Woodlands	Lewis's Woodpecker	Habitat described in the Migratory Birds Section.
Intermountain Cold Desert Scrub/Lower Montane Woodlands/Sagebrush	Loggerhead Shrike	Habitat described in the Migratory Birds Section.
Lower Montane Woodlands	Pinyon Jay	Habitat described in the Migratory Birds Section.
Sagebrush	Greater Sage-grouse	Habitat described in the Endangered, Threatened, Proposed, and Candidate Section.
Desert Playas and Ephemeral Pools	Snowy Plover	Habitat described in the Migratory Birds Section.
Sagebrush/ Lowland Riparian	Swainson's Hawk	Habitat described in the Migratory Birds Section.
	Mammals	
Intermountain Cold Desert Scrub/Sagebrush/Intermountain Rivers and Streams/Marsh/Lower Montane Woodlands/Springs and Springbrooks	California Myotis (*Myotis californicus*)	The species is found in a variety of habitats in Nevada, which includes lowland riparian, desert scrub, sagebrush steppe, montane grassland, pinyon-juniper woodland, and mixed-conifer, at lower to middle elevations. Mines, caves, rock crevices, and hollow trees are used as roosting sites, and small moths, flies, and beetles comprise the majority of their diet (Bradley et al. 2006).
Sagebrush/Intermountain Cold Desert Scrub	Dark Kangaroo Mouse (*Microdipodops megacephalus*)	Dark kangaroo mice are found in sandy and gravelly soils in desert scrub, sagebrush, grassland, and desert playa habitats in Nevada. Although the rodent will feed on insects, its diet primarily consists of

Key Habitats	Species	Notes
		seeds (WAPT 2012).
Cliffs and Canyons	Desert Bighorn Sheep	They prefer rough, rocky, and steep terrain; require freestanding water in the summer months or during drought; and eat a variety of grasses, shrubs, and forbs.
Intermountain Rivers and Streams/Marsh/Lower Montane Woodlands/Cliffs and Canyons/Spring and Springbrooks	Little Brown Myotis (*Myotis lucifugus*)	The bat primarily forages on aquatic insects such as caddis flies, midges, and mayflies (WAPT 2012)
Lower Montane Woodlands/Cliffs and Canyons	Long-Eared Myotis (*Myotis evotis*)	The species is predominately found in coniferous forests and gleans prey off of foliage, tree trunks, rocks, and the ground (WAPT 2012).
Intermountain Cold Desert Scrub	Pale Kangaroo Mouse (*Microdipodops pallidus*)	Dark kangaroo mice are found in sandy soils in valley bottoms dominated by greasewood and saltbush (WAPT 2012).
Intermountain Cold Desert Scrub, Sagebrush, Lower Montane Woodlands	Pallid Bat (*Antrozous pallidus*)	Pallid bats are found throughout Nevada in low to mid elevations in habitats that include pinyon-juniper, blackbrush, creosote, sagebrush, and salt desert scrub. Foraging occurs both in vegetation and on the ground surface, and the bat's diet primarily consists of ground-dwelling arthropods (Bradley et al. 2006).
Sagebrush	Pygmy Rabbit (*Brachylagus idahoensis*)	Pygmy rabbits can be found in areas with tall, dense sagebrush and loose soils. They primarily eat sagebrush and are the only rabbits in North America to dig their own burrows (WAPT 2012).
Lower Montane Woodlands/Cliffs and Canyons/Intermountain Rivers and Streams/Springs and Springbrooks	Spotted Bat (*Euderma maculatum*)	Spotted bats display a scattered distribution within Nevada, as their distribution is closely associated to the availability of cliff-roosting sites. The species has been found in pinyon-juniper, sagebrush, and riparian areas that range from 540-2,130 m (1,772-6,988 ft.) in elevation (Bradley et al. 2006).
Lower Montane Woodlands, Cliffs and Canyons/Intermountain Rivers	Townsend's Big-eared Bat (*Corynorhinus*	Townsend's big-eared bats are highly adaptable and inhabit a variety of habitats in Nevada that range from

Key Habitats	Species	Notes
and Streams/Springs and Springbrooks	*townsendii*)	210-3,500 m (689-11,483 ft.) in elevation. Primary threats to the species includes disturbance during the hibernation and maternity periods (Bradley et al. 2006).
	Amphibians	
Marshes/Springs and Springbrooks	Northern Leopard Frog (*Lithobates pipiens*)	The main threats to the species are habitat fragmentation and loss due to over-grazing, water impoundments, and development (WAPT 2012).
Springs and Springbrooks/Marshes	Dixie Valley Toad (*Anaxyrus boreas* ssp.)	Presently thought to be endemic to Dixie Valley.
	Plants	
	Lahontan Beardtongue (*Penstemon palmeri var. macranthus*)	Found along washes, roadsides, and canyon floors, predominately on carbonate-containing substrates and where moisture is available throughout the summer (NNHP 2001).
	Oryctes (*Oryctes nevadensis*)	Found in deep, loose sand of stabilized dunes, washes, and valley flats, often associated with greasewood, shadscale, four-wing saltbush, and other salt desert scrub species (NNHP 2001).
	Sodaville Milkvetch (*Astragalus lentiginosus var. sesquimetralis*)	Found in moist, alkaline hummocks and drainages with species such as greasewood and saltgrass (NNHP 2001).
	Tonopah Milkvetch (*Astragalus pseudiodanthus*)	Found with greasewood and other salt desert shrub taxa in drainages, valley floors, old beaches, and stabilized and active dune margins (NNHP 2001).

Environmental Consequences

BLM Sensitive Species: Although impacts to individual BLM sensitive species are discussed, the end result of impacts analysis for BLM sensitive species is whether or not impacts from actions on a project area would result in the federal listing of the entire species. There would be no direct impacts to BLM sensitive from the Proposed Action because this leasing action is purely administrative. None of the species would be upgraded to federal listing if this action were approved. Additionally, leasing alone does not directly authorize fluid minerals exploration and development activities. Direct impacts from these activities would be analyzed under a separate site specific environmental analysis and could include impacts to individuals and loss of habitat from actions such as groundwater pumping/withdrawal and the construction of roads and power line. These potential impacts are not meant to be all inclusive;

identification of the entire range of potential impacts would need to be addressed when site specific information is known.

For agency designated sensitive species, a lease stipulation (NSO, controlled surface use or time-limited) could be imposed for those portions of high value/key/crucial species habitat where other existing measures are inadequate to meet agency management objectives.

3.22 Socioeconomics

Fluid minerals operations have the potential to contribute to local, state, and national economies through the creation of jobs, generation of property taxes, royalty payments, and voluntary contributions to local communities. Royalty payments from geothermal leases are generally divided between the respective county, state, and federal agencies within which a lease resides. Royalties from oil & gas leasing is generally divided equally between the respective state and federal agencies where the lease resides. The construction of direct-use geothermal facilities for heating greenhouses and aquaculture operations or for dehydrating vegetables also contributes to economies through job creation and property tax generation. Areas of high geothermal potential are often located in rural areas, which typically have chronic, high unemployment rates. The development of fluid resources in such rural areas can improve local socioeconomic conditions.

Affected Environment

The project area encompasses portions of Lyon, Churchill, Mineral, and Nye Counties. The potential exists for several communities within these counties to experience socioeconomic effects as a result of fluid mineral leasing and subsequent exploration and development. A brief description of the current socioeconomic conditions on a county by county basis is provided below.

Lyon County – Lyon County encompasses 1,994 acres in west-central Nevada. The total population of Lyon County as of the 2010 census is estimated at 51,980 persons. The population of Lyon County experienced a -0.8 percent decrease from April 1, 2010 to July 1, 2013 (U.S. Census Bureau – Quick Facts). The City of Yerington is the county seat. Yerington's population is estimated to have increased 34 percent, from 2,883 to 3,871, between 2000 and 2007, respectively (U.S. Census Bureau - Annual Estimates of the Population for Incorporated Places in Nevada 2000 to 2007). Other notable population centers in Lyon County include Dayton and Fernley. The respective populations of Dayton and Fernley were 5,907 and 8,543 in 2000, and are estimated to have increased to 8,896 and 12,673 in 2007. In 2007, all industrial sectors in Lyon County supported 13,350 jobs. The largest employment sector in the county was Trade Transportation and Utilities (2,743 employees) followed closely by Manufacturing (2,600) and Government (2,328). Lyon County's largest employers are: Lyon County School District (Yerington), Amazon.com NVDC Inc. (Fernley), Lyon County (Yerington) Quebecor World Nevada Inc. (Fernley), MSC Industrial Supply Co. (Fernley), and Trex Company Inc. (Fernley). The unemployment rate in Lyon County was 6.5 percent in September 2007, which was 1.4 percent higher than the State of Nevada as a whole.

Churchill County - Churchill County is located east of Lyon County and encompasses 4,929 square miles. The total population of Churchill County as of the 2010 census is estimated at 24,877 persons. The population of Churchill County experienced a -3.3 percent decrease from April 1, 2010 to July 1, 2013. In 2005, the estimated population of Churchill County was 24,556, approximately 2.4 percent higher than the 2000 population (U.S. Census Bureau - Quick Facts). The City of Fallon is the county seat of Churchill County and home to Naval Air Station Fallon

In 2000, the population of Fallon was 7,536 (2000 Table DP-1). In 2005, the community had an estimated population of 8,103 (U.S. Census Bureau - Cities & Towns / All Places 2000 to 2005). In 2004, Churchill County attributed an average of 248 jobs to the labor category natural resources and mining which also includes agricultural forest related activities and fishing. The unemployment rate in Churchill County was 4.5 percent in September 2007, which was 0.6 percent lower than the State of Nevada as a whole.

Mineral County - Mineral County borders Churchill County to the south and encompasses 3,756 square miles. The total population of Mineral County as of the 2010 census is estimated at 4,772 persons. The population of Mineral County experienced a -3.3 percent decrease from April 1, 2010 to July 1, 2013. Hawthorne, the county seat and largest town in Mineral County, experienced a similar decrease from 3,311 in 2000 to an estimated population of 2,956 in 2005 (The Nevada State Demographer's Office - Nevada County Population Estimates July 1, 1990 to July1, 2005). In 2005, all industrial sectors in Mineral County supported 1,736 jobs. The largest employment sector in the county was the Government (585 employees) followed by Leisure and Hospitality (261). Mineral County's largest employers were all located in the City of Hawthorne and consisted of: Day & Zimmerman Hawthorne, El Capitan, Mineral County, Mineral County School District, and Mount Grant General Hospital. The unemployment rate in Mineral County was 7.3 percent in September 2007, which was 2.2 percent higher than the State of Nevada as a whole.

Nye County - Nye County is the third largest county in the United States totaling 18,064 square miles. Over 95 percent of the land in Nye County is administered by the federal government. Tonopah, the county seat, is located 239 miles southeast of Reno and 207 miles northwest of Las Vegas. The total population of Nye County as of the 2010 census is estimated at 43,946 persons. The population of Churchill County experienced a -3.8 percent decrease from April 1, 2010 to July 1, 2013 (U.S. Census Bureau – Quick Facts). Roughly 80 percent of that population resides in the City of Pahrump, 150 miles south-southeast of Tonopah. Mining, service, and government represent the largest economic sectors in the county. Industry in Nye County is supported by strong transportation links to California (Nye County borders California on the south). In addition, the area is in close proximity to Death Valley National Park, which provides recreational opportunities. The unemployment rate in Nye County was 7.6 percent in November 2007; 2.3 percent higher than the State of Nevada as a whole.

Environmental Consequences

The Electric Power Research Institute (2001) estimates that 4.0 jobs would be created per megawatt during the construction and development phase of a geothermal power plant, while 1.7 jobs per megawatt would be required for the continued operation and maintenance of a geothermal power facility. For example, development of a moderate sized 15-megawat geothermal power plant would translate to the creation of approximately 45 temporary jobs lasting from two to three years, and nearly 25 permanent, high skilled, full-time jobs for operation and maintenance. Development projects such as this would also provide an even greater number of full-time jobs in the community after considering the economic multiplier effect; the idea that a single expenditure in an economy can have repercussions throughout the entire economy. The long lifetime of geothermal plants means that they can become a stable, reliable part of a community's economic base (National Geothermal Collaborative 2007).

3.23 Vegetation

Affected Environment

The assessment area supports vegetation typical of the Great Basin region. The vegetation provides forage and cover for wildlife, livestock, and wild horses and burros located within the project area. It also provides ground cover and root mass for soil stability and development along with aiding infiltration. The extremes of climate, elevation, exposure and soil type all combine to produce a diverse growth environment for a wide variety of plants. The type of vegetation that grows in a particular area largely depends on soil types and average precipitation. Ecological site descriptions (ESD) provide detailed information regarding vegetative communities for each soil type and precipitation zone. The vegetative communities identified in the proposed lease areas are listed and detailed below.

Greasewood: This community occurs on floodplains and closed-basin bottomlands adjacent to playas. Greasewood is located on slopes that range from 0-2% with an elevation between 4,500-5,000 feet and occur in precipitation zones of 3-5 and 5-8 inches. Vegetation in this type is normally restricted to mounded areas that are surrounded by playa-like depressions or nearly level, usually barren, interspaces. This plant community is characterized by black greasewood (*Sarcobatus vermiculatus*), Basin wildrye (*Leymus cinereus*), saltgrass (*Distichlis spicata*), and alkali sacaton (*Spordoolus airoides*) are the most prevalent herbaceous species associated with this community. Saltgrass may extend into the interspace in some areas. Potential vegetative composition is typically 25% grasses, 5% forbs and 70% shrubs.

Salt Desert Shrub: This vegetative community occurs on alluvial terraces, fans, and foothills on all aspects. Salt desert shrubs are located on slopes that range from 0-30%, with 0-8% slopes the most typical. Salt Desert Shrub occurs at elevations between 4,500-6,000 feet and within precipitation zones of 3-5 and 5-8 inches. The plant community is characterized by shadscale (*Atriplex confertifolia*), bud sagebrush (*Picrothamnus desertorum*), and some winterfat (*Krascheninnikovia lanata*). Bud sagebrush and winterfat are palatable salt desert shrub species. Bottlebrush squirreltail (*Elymus elymoides*) and Indian ricegrass (*Achnatherum hymenoides*) are key grass species associated with this vegetative community. Alkali meadows are included in this plant community and consist of saltgrass and basin wildrye. Potential vegetative composition is typically 10% grasses, 5% forbs and 85% shrubs.

Big Sagebrush: This community occurs on terraces, alluvial fans, and low rolling hills on all exposures. Wyoming and Big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*; *Artemisia tridentata* ssp. *tridentata*) occurs on slopes that range from 2-50% with elevations ranging from 4,500-6,000 feet and within the 8-12 inch precipitation zone. This plant community is characterized by Wyoming and Basin big sagebrush, Thurber's needlegrass (*Achnatherum thurberianum*), Indian ricegrass, Basin wildrye, bottlebrush squirreltail, and Sandberg's bluegrass (*Poa secunda*). Arrowleaf balsamroot (*Balsamorhiza sagittata*) and Tapertip hawksbeard (*Crepis acuminata*) are important forb species associated with this vegetation type. Potential vegetative composition is typically 50% grasses, 15% forbs and 35% shrubs.

Black Sagebrush: This vegetative community occurs on low arid foothills, mountain side slopes and plateaus. Black sagebrush (*Artemisia nova)* occurs on slopes that range from 4-50% with elevations ranging from 5,000-7,000 feet and are associated with the 4-8 inch precipitation zone. Soils are often shallow over a calcareous pan, which limits effective water holding capacity and seeding success. Vegetation that characterizes this community consists of black sagebrush, bottlebrush squirreltail, and Sandberg's bluegrass. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is characteristic for communities that occur in the higher elevations. Potential vegetative composition is typically 50% grasses, 15% forbs and 35% shrubs.

Little sagebrush: This vegetative community occurs on mountain side slopes and plateaus. Little sagebrush occurs on slopes that range from 4-75% with elevations ranging from 5,000-9,000 feet and are associated with the 8-12 inch precipitation zone. Soils are often shallow over a calcareous pan, which limits effective water holding capacity and seeding success. This vegetative community is characterized by little sagebrush (*Artemisia arbuscula*), bottlebrush squirreltail, Sandberg's bluegrass, and bluebunch wheatgrass. Potential vegetative composition is typically 50% grasses, 15% forbs and 35% shrubs.

Piñon-Juniper Woodlands: This community occurs on upper alluvial fans and in the higher mountainous regions with slopes ranging from 30-50%. Elevations range from 5,500-9,000 feet. This community occurs within the 10-22 inch precipitation zone. Lower elevations (5,000-6,500 feet) communities are dominated by juniper, mid elevations (6,500-7,500 feet) by both piñon and juniper, and high elevations (above 7,500 feet) are predominately piñon pine. These plant communities are characterized by single-leaf piñon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*). There are localized ecosystems which support other juniper species such as common juniper (*Juniperus communis*) and Rocky Mountain juniper (*Juniperus scopulorum*). The understory, although sparse, consists of bluebunch wheatgrass, Sandberg's bluegrass, Thurber's needlegrass, basin wildrye, and needleandthread (*Hesperostipa comata*). Juniper and piñon trees dominate these areas; however, mountain big sagebrush, antelope bitterbrush, and curl-leaf mountain mahogany can be found within the community. Heavily wooded areas provide little forage and have a large amount of bare ground. Potential vegetative composition is typically 40% grasses, 15% forbs and 45% shrubs and trees.

Winterfat Bottoms: Winterfat communities occur generally in flats of drainage and flood plains. They typically occur in areas where slopes range from 0-2%. The elevation of this community ranges from 4000-6000 feet and within precipitation zones of 5-8 inches. Soils are typically sandy loam. The plant community is characterized and dominated by winterfat. It also includes vegetation such as bud sagebrush, Indian ricegrass and squirreltail. Potential vegetative composition is typically 10% grasses, 5% forbs and 85% shrubs.

Riparian: Small riparian communities occur within the project area and are associated with streams, springs, and seeps where water is at or near the surface for the majority of the year. Species associated with this community include willow (*Salix* spp.), quaking aspen (*Populus tremuloides*), cottonwoods (*Populus fremontii*, *P. Balsamifera* ssp. *Trichocarpa trichocarpa*, *augustifolia*), red-osier dogwood (*Cornus sericea*), rushes (*juncas* ssp.), sedges (*carex* ssp.), and cattail (*Typha latifolia*). Potential vegetative composition is typically 70% grasses and grass like species, 25% forbs and 5% shrubs.

Annuals: Although this vegetation type is not considered an ecological type, this plant community accounts for portions of the project area. Areas that have been disturbed may be invaded by invasive annual species, sometimes to the exclusion of native species. Dominant plants are cheatgrass (*Bromus tectorum*) and/or halogeton (*Halogeton glomeratus*). Other plants often present in these areas are Russian thistle (*Salsola kali*), clasping pepperweed (*Lepidium perfoliatum*), tumble mustard (*Sisymbrium altissimum*) and Russian knapweed (*Centeurea repens*).

Environmental Consequences

There would be no direct impacts from issuing new fluid mineral leases alone because leasing does not directly authorize fluid mineral exploration and development activities. Direct impacts from these activities would be analyzed under a separate site-specific environmental analysis.

Any future exploration and development activities would likely result in the complete removal of vegetation in the developed areas. These impacts could promote the erosion of soils and the establishment of noxious weeds and/or invasive, non-native species. The impact would persist until the developed areas were revegetated during reclamation. If parcels were developed in the future, site-specific mitigation measures and BMPs would be attached as COAs for each proposed activity, which would be analyzed in a site-specific NEPA document.

A number of ongoing and potential actions in the area, such as mining, mineral and geothermal exploration, off-highway vehicle use, and livestock grazing could cumulatively impact vegetation. These impacts include erosion of soils, disturbance of microbiotic crusts, disturbance or removal of vegetation and soil compaction. The proposed action would not likely contribute to cumulative impacts. However, concurrent exploration and production actions would contribute to the cumulative impacts. With implementation of BMPs and the conditions of approval, impacts could be minimized. Revegetation and rehabilitation following projects would mitigate impacts to vegetation. It is expected that the proposed action may contribute to cumulative impacts through the reasonably foreseeable role of oil and gas exploration and development. Overall impacts within the project area could be negligible, especially when effectively mitigated.

NO ACTION ALTERNATIVE

Under the No Action Alternative, no new leases would be processed in the project area. The only fluid mineral activities that would occur in these areas would be casual use, or site-specific exploration and development permitted under existing fluid mineral leases. Therefore impacts of the No Action Alternative on the affected resources described in this EA would be negligible in the six proposed leasing areas.

4.0 CUMULATIVE EFFECTS

The analysis presented in this section, as required by CEQ regulations (40 CFR 1500-1508), addresses the potential cumulative impacts associated with the Proposed Action and No Action alternatives. The CEQ regulations state that the cumulative impact analysis should include the anticipated impacts to the environment resulting from "the incremental impact of [an] action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time" (40 CFR 1508.7).

The cumulative impact analysis in this section builds upon the analyses of the direct and indirect impacts of anticipated future actions to be taken consistent with the Proposed Action and No Action alternatives presented above. This section also tiers off of and incorporates by reference the cumulative impact analysis (Chapter 5) in the PEIS for Geothermal Leasing in the Western United States (BLM and USFS, 2008) at http://www.blm.gov/geothermal_eis, where appropriate. The region of influence for each resource evaluated by the cumulative impacts analysis is, unless otherwise noted, the project area defined by the six proposed leasing areas.

The reasonably foreseeable time frame for future actions evaluated in this cumulative analysis is 20 years from the decision to allocate lands as available for fluid mineral leasing. While it is difficult to project reasonably foreseeable future actions (or trends) beyond a 20-year time frame, it is acknowledged that the effects identified in the cumulative impacts analysis would likely continue beyond the 20-year horizon.

Proposed Action

Past, Present and Reasonably Foreseeable Future Actions

The six leasing areas comprising the project area for the Proposed Action fall into one of two general categories, rural (containing no main population center) or urban (adjacent to a main population center). In the more rural leasing areas such as the Dixie and Edwards Creek Valleys, Gabbs Valley, Teels Marsh and Rhodes Salt Marsh, the dominant past, present, and reasonably foreseeable future activities on private and federal land have been and continue to be mineral exploration, development and production (extraction), livestock grazing, recreation, transmission and distribution system construction, and transportation. The dominant past, present, and reasonably foreseeable future activities on the private and federal land in the more urban lease areas of Fallon and Wabuska have been and would continue to be agricultural, residential and commercial property development, urbanization and resource use (e.g. water).

Fluid mineral leasing has occurred within all six leasing areas comprising the project area in the past. As a result, fluid mineral lessees have conducted and would continue to conduct exploration and development activities in accordance with their existing leases. Other past, present and reasonably foreseeable activities in the project area include realty actions, wild horse gathers, noxious weed treatment, fire suppression and rehabilitation, greater sage grouse habitat improvement projects, and fence construction.

Cumulative Impacts of the Proposed Action

Leasing fluid minerals on federal lands in the six leasing areas comprising the Proposed Action would not contribute to cumulative impacts on resources or resource uses in the project area. Likewise, issuing leases does not cause direct impacts as it does not authorize any ground disturbing activities. Issuing fluid mineral leases is, however, a conditional commitment of resources for future exploration and

utilization. While the number, variety, and magnitude of actions on federal lands that may be considered to occur is great, information about how many future projects may actually be undertaken is lacking, and information about the likely locations of future development is unknown.

In light of these considerations, the cumulative impact analysis for this EA tiers off of and incorporates by reference the general cumulative impact analysis (Chapter 5) in the PEIS for Geothermal Leasing in the Western United States (BLM and USFS, 2008). That analysis assesses the incremental contribution of the direct and indirect impacts of fluid mineral leasing as well as other anticipated future actions associated with development of fluid mineral resources, along with the added impacts from past, present, and reasonably foreseeable future actions similar to those identified above.

The majority of the area of the Proposed Action, excluding the Fallon and Wabuska lease areas, is located on federal lands in a relative low-use rural setting far away from population centers. In consideration of the cumulative impacts analysis in the PEIS (BLM and USFS, 2008), the overall cumulative impacts of past activities, current activities, and other reasonably foreseeable future actions, inclusive of the potential incremental impacts resulting from the Proposed Action, would be negligible in these rural areas.

The Fallon and Wabuska Lease Areas incorporate or reside near the population centers of Fallon and Yerington, respectively. The cumulative impacts in these areas would depend on the amount of growth that is anticipated to occur in these nearby population centers. The various activities on the federal land in these areas would be mitigated through site-specific analysis in consideration of cumulative impacts, and the impacts for activities on the adjacent private lands would be mitigated through the planning efforts of local agencies. In consideration of the cumulative impacts analysis in the PEIS (BLM and USFS, 2008), the overall cumulative impacts of past activities, current activities, and other reasonably foreseeable future actions, inclusive of the potential incremental impacts resulting from the Proposed Action within the Fallon and Wabuska lease areas would also be negligible.

No Action Alternative
Under the No Action Alternative, no new leases would be processed in the project area. The only fluid mineral activities that would occur in these areas would be casual use, or site-specific exploration and development permitted under existing fluid mineral leases. Cumulative impacts from potential future exploration and development activities would be similar in nature to those described under the Proposed Action. Therefore the cumulative impacts of the No Action Alternative on the affected resources described in this EA would also be negligible in the six proposed leasing areas. The primary difference between the Proposed Action and No Action Alternative would be that the incremental impacts under the No Action Alternative from past leasing activities in the project area would all but cease after the ten years leasing period, and the only impacts from past leasing after that time would be related to fluid mineral production.

5.0 MONITORING

Monitoring needs for this action have been identified in the BMPs and stipulations that have been attached to this document in Appendix B.

6.0 PERSONS, GROUPS, AND AGENCIES CONSULTED

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Matt Simons	Realty Specialist	Land Use and Land Use Authorizations

7.0 REFERENCES

Berger, D.L. 2000. Water-Budget Estimates for the 14 Hydrographic Areas in the Middle Humboldt River basin, North-Central Nevada: U.S. Geological Survey Water-Resources Investigation Report 00-4168.

Bloomflied, K.K., Moore, J.N., and Neilson, R.N. 2003. Geothermal energy reduces greenhouse gases. Geothermal Resources Council Bulletin, 32.

BLM. 1984 Grazing Management. Manual Handbook Number H-4120-1. Washington, D.C.

------. 1985. Lahontan Resource Management Plan and Environmental Impact Statement.

------. 1988. Mina Habitat Management Plan. Unpub. Doc. CCDO Files.

------. 2001. Consolidated Resource Management Plan, BLM Carson City Field Office. May 2001.

------. 2002a. Wild Free-Roaming Horses and Burros Live in Herd Management Areas. Internet Web site: http://www.nv.blm.gov/hma/ .

------. 2002b. Environmental Assessment for Leasing of Geothermal Resources Managed by the BLM CCFO. EA-NV-030-02-021. July 2002.

------. 2006. Carson City Field Office Geothermal Leasing Environmental Assessment, BLM Carson City Field Office. EA-NV-030-06-025. July 2006.

------. 2007. IM-2008-050 Migratory Bird Treaty Act – Interim Guidance. Dated December 18, 2007. Unpub. Doc. CCDO files.

------. 2007b. Vegetation Treatments on Bureau of Land Management Lands in 17 Western States, Programmatic Environmental Report. U.S. Department of the Interior.

------. 2009. Fluid Mineral Leasing within Six Areas on the Carson City District. BLM Carson City District Office. DOI-BLM-NV-C030-2009-0003-EA. January 2009.

BLM and USFS, 2007, Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (i.e., The Gold Book, 4th edition, 2007) at http://www.blm.gov/bmp

BLM and USFS, 2008 Programmatic Environmental Impact Statement (PEIS) for Geothermal Leasing in the Western United States at http://www.blm.gov/geothermal_eis

Bradley, P.V., M.J. O'Farrell, J.A. Williams, and J.E. Newmark. Editors. 2006. The Revised Nevada Bat Conservation Plan. Nevada Bat Working Group. Reno, Nevada. 216 pp.

Drews, M. and Ingbar, E. 2007. The Carson City Field Office Cultural Resources Model for Fuels Management. Gnomon, Inc., Carson City. Report and electronic data on file at the Bureau of Land Management, Carson City District Office.

Farag, Aida M. and David D. Harper. In Press. A Review of Environmental Impacts of Salts from Produced Waters on Aquatic Resources. International Journal of Coal Geology.

Federal Renewable Energy Task Force. 2007. Renewable Energy in Nevada: Regional Geothermal Potential and Land Management Map compiled for the Federal Renewable Energy Task Force (FRETF).

Garside, L.J., Hess, R.H., Fleming, K.L., and Weimer, B.S. 1988. Oil and gas developments in Nevada: Nevada Bureau of Mines and Geology Bulletin 104, 136 pp.

Geothermal Energy Association. 2007. An Assessment of Geothermal Resource Development Needs in the Western United States. Daniel J. Fleischmann. January 2007.

Great Basin Bird Observatory (GBBO). 2010. Nevada Comprehensive Bird Conservation Plan, ver.1.0. Great Basin Bird Observatory, Reno, NV. Available online at http://www.gbbo.org/bird_conservation_plan.html

Jenner, Steffen and Alberto J. Lamadrid. 2013. Shale Gas vs. Coal: Policy Implications from Environment Impact Comparisons of Shale Gas, Conventional Gas, and Coal on Air, Water, and Land in the United States. Energy Policy 53:442-453.

Kharaka, Y. K., J. J. Thorsden, C. H. Conaway, R. B. Thomas. 2013. The Energy-Water Nexus: Potential Groundwater-Quality Degradation Associated with Production of Shale Gas. Procedia Earth and Planetary Science 7:417-422.

Kreckel, Ken, Directional Drilling: The Key to the Smart Growth of Oil and Gas Development in the Rocky Mountain Region, 56 p.

Lincoln, F.C. 1982. Mining Districts and Mineral Resources of Nevada (reprint of 1923 edition). Nevada Publications, Las Vegas.

McCabe and Lane. 2008. A Class I Cultural Resources Overview for Six Area Proposed for Fluid Mineral Leasing, Churchill, Lander, Lyon, mineral, and Nye Counties, Nevada. Report on file at Bureau of Land Management, Carson City District Office (CRR 3-2477).

McIvor. 2005. Important Bird Areas of Nevada. Lahontan Audubon Society pub. Reno, NV. 150 pp.

Myrick, David F. 1962. Railroads of Nevada and Eastern California, Volume One – The Northern Roads. Howell-North Books, Berkeley, California.

Neel, L.A. 1999. Nevada Partners in Flight Bird Conservation Plan. http://www.partnersinflight.org/bcps/plan/pl-nv-10.pdf

Nevada National Heritage Program (NNHP). 2001. Rare Plant Fact Sheet: Lahontan Beardtongue. http://www.heritage.nv.gov/sites/default/files/atlas/penstpalmemacra.pdf

Nevada National Heritage Program (NNHP). 2001. Rare Plant Fact Sheet: Oryctes. http://www.heritage.nv.gov/sites/default/files/atlas/oryctnevad.pdf.

Nevada National Heritage Program (NNHP). 2001. Rare Plant Fact Sheet: Sodaville Milkvetch. http://www.heritage.nv.gov/sites/default/files/atlas/astralentisesqu.pdf

Nevada National Heritage Program (NNHP). 2001. Rare Plant Fact Sheet: Tonopah Milkvetch. http://www.heritage.nv.gov/sites/default/files/atlas/astrapseud.pdf

Paschke, Dr. Suzanne, USGS, Denver, Colorado, September 2011.
Resource Conservation and Recovery Act (RCRA) of 1976 (PL 94-580 (42 USC §6901)).

Pendleton, L.S. A., McLane, A. R., and Thomas, D.H. 1982. *Cultural Resources Overview, Carson City District, West Central Nevada*. Cultural Resources Series No. 5, Part 1. Nevada State Office of the Bureau of Land Management, Reno.

Stewart, J.H., and Carlson, J.E. 1978. Geologic Map of Nevada. United States Geological Survey and Nevada Bureau of Mines and Geology.

Swackhamer, Deborah. 2013. Potential Impacts of Hydraulic Fracturing on Water Resources. In C. Coussens and R. M. Martinez (eds.), Health Impact Assessment of Shale Gas Extraction: Workshop Summary. Washington D.C., National Academies Press, pp. 61-69.

Tingley, J.V. 1992. *Mining Districts in Nevada*. Nevada Bureau of Mines and Geology Report 47. University of Nevada, Reno.

Tonenna, D. 2007. Specialist report to 2007 oil and gas leasing. Unpub. Doc. CCDO files.

U.S. Census Bureau, 2007. American Fact Finder, US bureau of the Census, Washington, D.C. Internet Web site: http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml

U.S. Fish and Wildlife Service. 1985. Endangered and threatened wildlife and plants; final rule to determine endangered status and critical habitat for the White River springfish and the Hiko White River springfish. Federal Register 50: 39123-39127.

U.S. Fish and Wildlife Service. 1995. Lahontan cutthroat trout, *Oncorhynchus clarki henshawi*, Recovery Plan. Portland, OR. 147 pp.

U.S. Fish and Wildlife Service. 1998. Recovery plan for the aquatic and riparian species of Pahranagat Valley. Endangered Species Program, Region 1, Portland, Oregon.

U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. [Online version available at <http://www.fws.gov/migratorybirds/>]

U.S. Fish and Wildlife Service. 2012. Hiko White River Springfish (*Crenichthys baileyi grandis*) and White River Springfish (*Crenichthys baileyi baileyi*) 5-Year Review: Summary and Evaluation.

U.S. Geological Survey. 2002. Ground Water Atlas Archive of the United States. http://pubs.usgs.gov/ha/ha730/gwa.html

U.S. Geological Survey. 2004. Geologic Provinces of the United States: Basin and Range Province. http://geomaps.wr.usgs.gov/parks/province/basinrange.html

Wigand, Peter E., and Cheryl L. Novak. 1992. Dynamics of Northwest Nevada Plant Communities During the Last 30,000 Years. In Great Basin Aquatic System History of Water: Eastern Sierra Nevada, Owens Valley, White-Inyo Mountains, Volume 4, edited by Clarence A. Hall, Jr., Victoria Doyle-Jones, Barbara Widawski, pp. 40-62. White Mountain Research Station Symposium. University of California, Los Angeles.

Wildlife Action Plan Team (WAPT). 2012. Nevada Wildlife Action Plan. Nevada Department of Wildlife, Reno.

Young, D. Craig. 2014. Volume 1. Prehistoric Context. A Historic Context and Research Design for the Carson City District Office. Far Western Anthropological Research Group, Inc. Davis, California.

http://www.fws.gov/nevada/protected_species/index.html

http://heritage.nv.gov/get_data

www.natureserve.com