

ENVIRONMENTAL ASSESSMENT

ORNI 32, LLC Dixie Meadows Geothermal Utilization Project

DOI-BLM-NV-C010-2016-0014-EA

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ACRONYMS AND ABBREVIATIONS

Full Phrase

ACSR	aluminum conductor steel-reinforced
APLIC	Avian Power Line Interaction Committee
ARPA	Archaeological Resources Protection Act
BBCS	Bird and Bat Conservation Strategy
BGEPA	Bald and Gold Eagle Protection Act
BLM	United States Department of the Interior, Bureau of Land Management
BMP	best management practice
°C	degrees Celsius
CCD	BLM Carson City District Office
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CRMP	Consolidated Resource Management Plan
CWA	Clean Water Act
DOI	United States Department of the Interior
DON	United States Department of the Navy
EA	environmental assessment
ESA	Endangered Species Act of 1973
°F	degrees Fahrenheit
FLPMA	Federal Land Policy and Management Act of 1976
FONSI	Finding of No Significant Impact
GBBO	Great Basin Bird Observatory
gen-tie	generation-tie
GHMA	general habitat management area
gpm	gallons per minute
IBA	Important Bird Area
KOP	key observation point
kV	kilovolt
MBTA	Migratory Bird Treaty Act
mg/L	milligrams per liter
MOU	memorandum of understanding
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NDEP	Nevada Department of Environmental Protection
NDOM	Nevada Division of Minerals
NDOW	Nevada Department of Wildlife
NDWR	Nevada Division of Water Resources
NEPA	National Environmental Policy Act of 1969

NHPA	National Historic Preservation Act of 1966, as amended
NNHP	Nevada Natural Heritage Program
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSO	No Surface Occupancy
OHMA	other habitat management area
OHW	ordinary high water mark
ORNI 32	ORNI 32, LLC
Ormat	Ormat Nevada, Inc.
PEIS	programmatic environmental impact statement
PHMA	priority habitat management area
RDF	required design feature
ROD	Record of Decision
ROW	right-of-way
SWReGAP	Southwest Regional Gap Analysis Project
TDS	total dissolved solids
UIC	Nevada Department of Environmental Protection Underground Injection Control
US	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VRM	visual resource management
WDO	BLM Winnemucca District Office
WSA	Wilderness Study Area

CHAPTER I

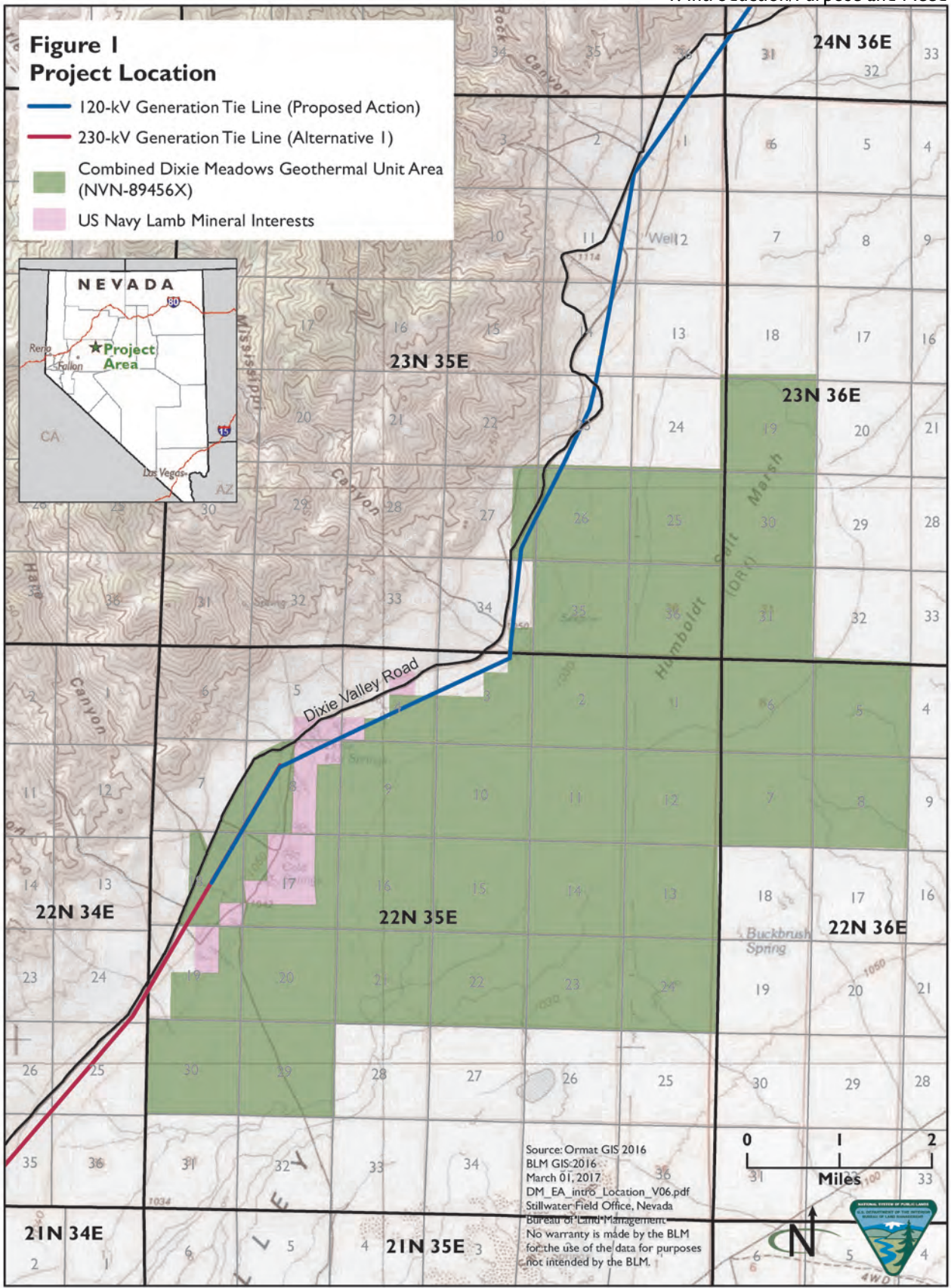
INTRODUCTION/PURPOSE AND NEED

The United States (US) Department of Interior (DOI), Bureau of Land Management (BLM) Carson City District (CCD), Stillwater Field Office, has prepared this Environmental Assessment (EA) to analyze potential impacts on the human and natural environment that may result from geothermal exploration and development within the Ormat Nevada Inc. (Ormat) Combined Dixie Meadows Geothermal Unit Area (NVN-89456X), and from the construction and operation of an associated generation-tie (gen-tie) line to bring electricity to market.

I.1 INTRODUCTION

ORNI 32, LLC (ORNI 32), a subsidiary of Ormat, is proposing the Dixie Meadows Geothermal Utilization Project in Dixie Valley, approximately 43 miles northeast of Fallon in Churchill County, Nevada (see **Figure I**, Project Location). ORNI 32 proposes to construct up to two geothermal power plants; drill, test, and operate up to 15 geothermal production and injection well sites and 8 core hole sites; construct and operate pipelines to carry geothermal fluid between well fields and the power plants; and construct either a 120-kilovolt (kV) or a 230-kV gen-tie line and associated structures. The gen-tie would be constructed along one of two routes; one extending to the northeast to Jersey Valley, and one extending to the south to the NV Energy power line near US Highway 50. ORNI 32 has not yet finalized gen-tie interconnection agreements; both routes are analyzed in this EA.

The proposed power plants and related wells and pipelines would be located on geothermal leases that are on public lands administered by the BLM, CCD, Stillwater Field Office, and a segment of US Navy lands that have mineral rights owned by Ormat. The northern portion of the first gen-tie line option would be located off the leases, but on public lands administered by the BLM Winnemucca District Office, Humboldt River Field Office and a portion of US Navy lands. This gen-tie would have a voltage of 120-kV.



The second gen-tie option would be located entirely on public lands administered by the BLM, CCD, Stillwater Field Office, and US Navy lands. The second gen-tie option would have a voltage of 230-kV. Approximately 26.7 miles of this line would be located within an area that has been segregated from all forms of appropriation under the public land laws, including the mining laws, mineral leasing laws, and geothermal leasing laws, subject to valid existing rights. The BLM has segregated this area in response to an application received from the Department of the Navy (DON) for a withdrawal expansion for military use of the Naval Air Station Fallon, Fallon Range Training Complex in Churchill County, Nevada under the 1958 Engle Act.¹ The segregation is in effect for a period of two years from September 2, 2016 (date of publication in the *Federal Register*), unless the application/proposal is cancelled or approved prior to that date, subject to valid existing rights.

According to the BLM's September 2, 2016, *Federal Register* Notice, "Licenses, permits, cooperative agreements, or discretionary land use authorizations may be allowed during the period of segregation, but only with the approval of the BLM Authorized Officer and, as appropriate, with the concurrence of DON" (*Federal Register* Notice Vol. 81, No. 171, Notice of Application for withdrawal extension; Notice of Application for Withdrawal Expansion; and Opportunity for Public Meeting; Naval Air Station, Fallon, Nevada).

The proposed power plants would have a net rated capacity of up to 30 megawatts (MW) each. The power plants would utilize binary technology to produce electricity from the geothermal resource, and would have air cooling. Geothermal production and injection wells, pipelines, roads, and associated facilities would be constructed to support the power plant.

The gen-tie facilities would connect the proposed Dixie Meadows geothermal power plants into the NV Energy power grid so that electricity can be delivered to consumers. Under the first routing option, the gen-tie line would originate at each plant's substation, extend about 48.1 miles to the northeast, and connect to an existing power line at Ormat's Jersey Valley Geothermal Power Plant. This gen-tie route would parallel the existing Oxbow power line for the first 16 miles from the plant sites to the Terra-Gen Dixie Valley power plant. From there to Jersey Valley, it would mostly follow existing gravel roads, up to the Jersey Valley plant where it would tie into an existing 120-kV transmission line. The gen-tie line would be in both Churchill and Pershing Counties.

The second gen-tie route under consideration in this EA would also connect the proposed Dixie Meadows geothermal power plants into the NV Energy power grid, but it would extend approximately 31.3 miles to the south. At its southern terminus, this gen-tie would connect to NV Energy's Fort Churchill to Gonder 230-kV line at the proposed Middlegate Substation.

¹ For more information, refer to <https://frtcmmodernization.com/>.

As described in **Chapter 2**, ORNI 32 would only construct and operate one gen-tie line. However, two routes are analyzed in this EA.

A geothermal lease typically grants the lessee access to geothermal resources in the lease area for a period of 10 years. The terms of the lease require the lessee to show a certain level of diligence toward developing the geothermal resources within the lease area or the lease may be terminated. Once an area is developed for productive use of geothermal energy, the lease allows the lessee use of the resource for 40 years, with a right of renewal for another 40 years upon revised National Environmental Policy Act of 1969 (NEPA) analysis.

Geothermal exploration and production on federal land conducted through leases is subject to terms and stipulations to comply with all applicable federal, state, and local laws and regulations pertaining to sanitation, water quality, wildlife, safety, and reclamation (see **Appendix A**, Geothermal Lease Stipulations). Lease stipulations may be site-specific and are derived from the environmental analysis process at the time of lease issuance.

This EA considers the potential environmental impacts of the Proposed Action and alternatives and has been prepared in accordance with the NEPA, the Council on Environmental Quality regulations implementing NEPA, and the Federal Lands Policy and Management Act of 1976 (FLPMA).

I.2 BACKGROUND

The Combined Dixie Meadows Geothermal Unit Area (NVN-89456X) was created by combining the Dixie Hope and Dixie Meadows geothermal lease units. It also contains mineral rights to 760 acres of US Navy land known as the Lamb Mineral interests.

Two EAs have been completed for lands within the Combined Dixie Meadows Geothermal Unit Area. Findings of No Significant Impact (FONSIs) and Decision Records for the TGP Geothermal Exploration EA (DOI-BLM-NV-C010-2010-0010-EA) and the Dixie Meadows Geothermal Exploration Project EA (DOI-BLM-NV-C010-2011-0516-EA) were signed in June 2010 and January 2012, respectively. Combined, the two EAs analyzed and permitted up to 34 well pads (with multiple wells on each pad), 205.6 acres of surface disturbance on BLM-administered lands, and 4 acres of surface disturbance on the US Navy's Lamb Mineral Interests. Two groundwater wells were also approved.

Ormat acquired TGP's Dixie Hope leases in December 2010 and on February 1, 2012, those portions of the Dixie Meadows and Dixie Hope lease blocks that remain of interest to Ormat were consolidated into the Combined Dixie Meadows Geothermal Unit Area (NVN-89456X). **Table I** displays the leases held and their legal land descriptions.

Table 1
Leases Within the Combined Dixie Meadows Geothermal Unit Area (NVN-89456X)

Lease Number	Section Number	Township, Range
NVN-60686	17, 18, 19, 20	T22N, R35E
NVN-60685	9, 10, 15, 16	T22N, R35E
Lamb Mineral Interest	5, 8, 17, 18, 19	T22N, R35E
NVN-83934	1, 2, 3, 4, 8	T22N, R35E
NVN-83935	11, 12, 13, 14	T22N, R35E
NVN-83936	21, 22, 23, 24	T22N, R35E
NVN-83937	25, 26, 35, 36	T22N, R35E
NVN-83939	5, 6, 7, 8	T22N, R36E
NVN-83941	4, 17, 19, 20, 30, 31	T22N, R36E
NVN-86885	27, 29, 30	T22N, R35E
NVN-91823	3, 4, 18	T22N, R35E
NVN-92479	7, 8, 18	T22N, R35E
NVN-92717	18	T22N, R35E

Source: Ormat GIS 2016

Since the two FONSI and Decision Records were issued, seven wells (three full-size 42(12)-9, 23A-8, and 24-8 and four core holes; 22-8B, 23-8, 24A-8, and 86-7) have been drilled. The results of these wells indicate that geothermal resources are more likely to exist near the western margin of the valley. Consequently, Ormat obtained two additional geothermal lease areas (N-92479 and N-92717) on December 1, 2013 on the western side of the lease blocks, which extend up to the boundary with the Stillwater Range Wilderness Study Area (WSA) that is present west of the Dixie Valley road.

Table 2 summarizes existing and previously permitted and approved wells in the geothermal unit area under the previous EAs. **Figure 2**, Existing and Permitted Wells, depicts the locations of these wells.

Table 2
Existing and Permitted Wells

Kettleman Well Number	UTM Coordinates¹		Well Status	Well Type² and Depth (If Drilled)
	Easting	Northing		
Lamb Mineral Interests				
57-5	408429	4406136	Previously permitted, not drilled	Deep core hole/full-size well
58-5	408424	4405877	Previously permitted, not drilled	Deep core hole/full-size well
Lease Number N-60685 T22N; R35E				
21-9	409586	4405668	Existing	Monitoring well (MW-1); 472 feet
42(12)-9	409994	4405393	Existing	Full-size well; 7,442 feet

Table 2
Existing and Permitted Wells

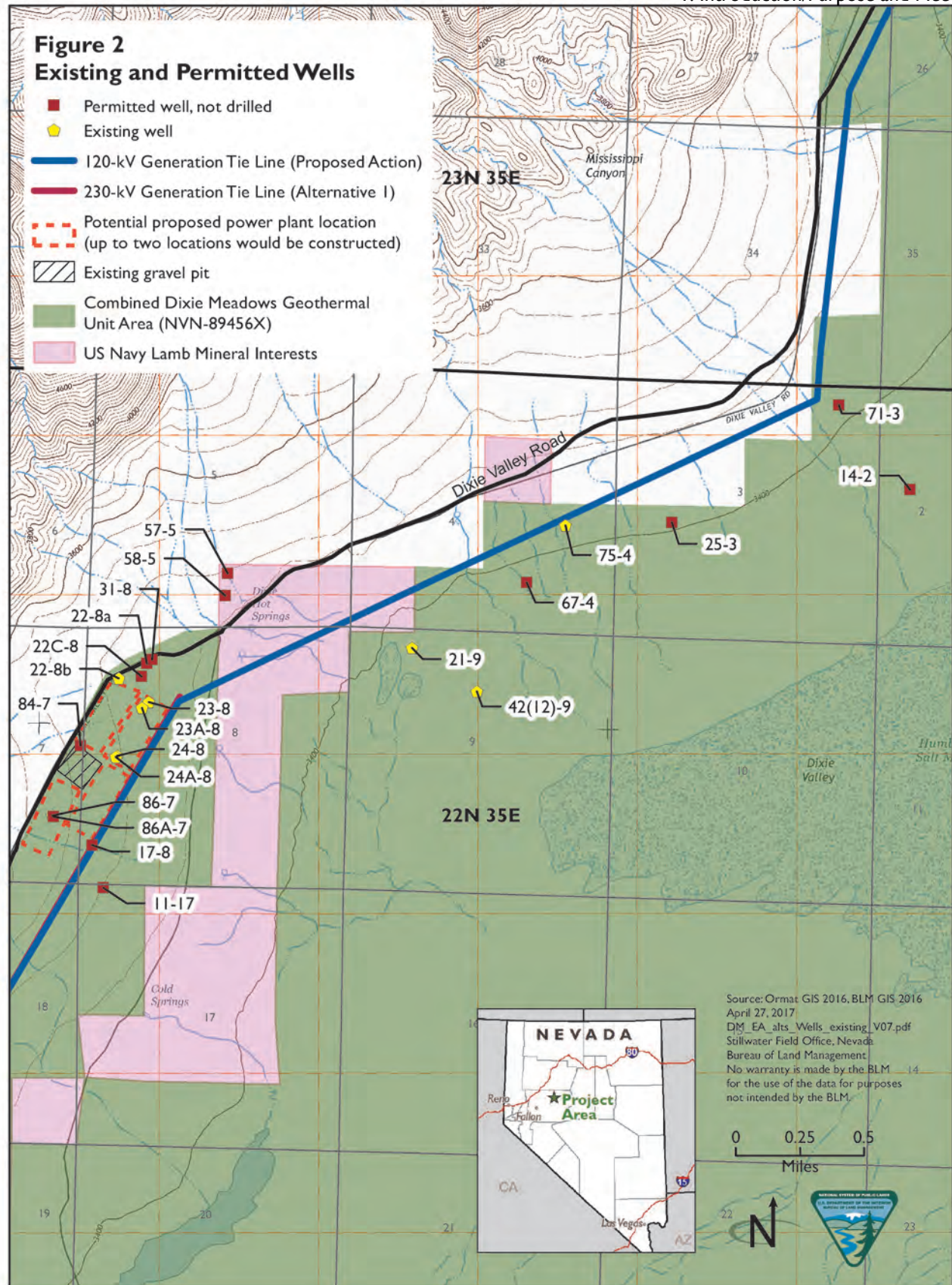
Kettleman Well Number	UTM Coordinates ¹		Well Status	Well Type ² and Depth (If Drilled)
	Easting	Northing		
Lease Number N-60686 T22N; R35E				
11-17	407646	4404163	Previously permitted, not drilled	Deep core hole
Lease Number N-83934 T22N; R35E				
75-4	410549	4406437	Existing (currently being drilled)	Full-size well; at least 5,000 feet depth planned
71-3	412266	4407189	Previously permitted, not drilled	Deep core hole/full-size well
14-2	412714	4406660	Previously permitted, not drilled	Deep core hole/full-size well
25-3	411218	4406454	Previously permitted, not drilled	Deep core hole/full-size well
67-4	410306	4406077	Previously permitted, not drilled	Deep core hole/full-size well
Lease Number N-92479 T22N; R35E				
84-7	407504	4405053	Previously permitted, not drilled	Deep core hole
86-7	407326	4404615	Existing	Core hole; 1,000 feet
86A-7	407332	4404610	Previously permitted, not drilled	Full-size well
22-8b	407743	4405476	Existing	Core hole; 1,000 feet
22-8a	407918	4405570	Previously permitted, not drilled	Core hole; 1,000 feet depth planned
22C-8	407886	4405488	Previously permitted, not drilled	Full-size well
31-8	407955	4405593	Previously permitted, not drilled	Core hole; 1,000 feet depth planned
23-8	407925	4405330	Existing	Deep core hole; 4,700 feet
23A-8	407890	4405291	Existing	Full-size well; 4,758 feet
24-8	407734	4404988	Existing	Full-size well; 3,060 feet
24A-8	407724	4404983	Existing	Core hole; 750 feet
17-8	407578	4404429	Previously permitted, not drilled	Full-size well

Source: Ormat GIS 2016

¹ Coordinates are in NAD1983 UTM 11N (meters)

² Well types are as follows:

- Core holes are wells that are drilled using a hollow drill bit; whole rock samples (cores) can be extracted from wells drilled this way
- Deep core holes are cores drilled to a relatively greater depth
Full-size wells are drilled to a wider diameter than core holes, allowing for either production or injection use, depending on observed well characteristics
- Monitoring wells are wells used for monitoring various characteristics of water resources



I.3 PURPOSE AND NEED

The purpose of the Proposed Action is to allow ORNI 32 to develop the geothermal resources within the Dixie Meadows Geothermal Unit Area on public lands managed by the BLM that are leased to ORNI 32.

The need for the Proposed Action is established by the BLM's responsibility under the Geothermal Steam Act of 1970; the regulations under 43 Code of Federal Regulations (CFR) 3270; the Minerals Leasing Act of 1920, as amended; and Secretarial Order 3285 of March 11, 2009. In addition, states across the western US have adopted renewable portfolio standards that require electricity providers to obtain a certain percentage of power from renewable energy resources. Nevada's renewable portfolio standard requires that the state's utilities procure 25 percent of their energy from renewable sources by 2025. California's renewable portfolio standard requires 33 percent by 2020.

The Dixie Meadows Geothermal Utilization Project would help to meet these mid- and long-term regional needs.

I.4 LAND USE PLAN CONFORMANCE STATEMENT

The Proposed Action and alternatives described below are in conformance with the CCD Consolidated Resource Management Plan (CRMP; <http://bit.ly/2kiCEHj>). The desired outcome for minerals and energy management under the CRMP, page MIN-1, is to "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" (BLM 2001). The CRMP minerals and energy management direction applies the following restriction on geothermal leasing: "No Surface Occupancy (NSO) 1. Within 500 feet of any water" (BLM 2001). The Proposed Action is in conformance with this measure.

The CRMP has been amended by the Nevada and Northeastern California Greater Sage-Grouse Approved Resource Management Plan Amendment (Approved Greater Sage-Grouse Plan Amendment; BLM 2015a; <http://bit.ly/1QFzXv7>). The Record of Decision (ROD) and Approved Resource Management Plan Amendments for the Great Basin Region (henceforth referred to as the Decision; BLM 2015a), including the Greater Sage-Grouse Sub-Region of Nevada and Northeastern California, were signed on September 21, 2015 by the Director of the BLM and the Assistant Secretary of Land and Minerals Management. This Decision, in conjunction with the approved resource management plans and approved resource management plan amendments, constitutes BLM land use planning decisions to conserve the greater sage-grouse and its habitats throughout its remaining range that is located on public lands administered by the BLM. The efforts of the BLM, in coordination with the Forest Service on National Forest System lands within the remaining range of the species, constitute a coordinated strategy for conserving the greater sage-grouse and the sagebrush-steppe ecosystem on most federal lands on which the

species depends. The Proposed Action has components that fall within areas mapped as Other Habitat Management Areas (OHMA).

Appendix B of the Decision states that impact evaluations to greater sage-grouse leks are required for actions requiring NEPA analysis. The appendix states minimum lek buffer distances for various activities, including surface disturbance, human activities, and natural vegetation removal (3.1 miles); infrastructure related to energy development (3.1 miles); and tall structures such as transmission towers and lines (2 miles). The nearest pending lek is approximately 3.7 miles from the northern gen-tie alignment. Additionally, there is one lek with an unknown status, and one pending lek located approximately 4.5 and 5 miles from the northern gen-tie alignment, respectively.

Appendix C of the Decision states that required design features (RDFs) are required for certain activities in all greater sage-grouse habitat. RDFs establish the minimum specifications for certain activities to help mitigate adverse impacts. The RDFs are included as **Appendix B** of this EA (Greater Sage-Grouse Required Design Features). Project components are in conformance with the amended RMP through incorporation of the applicable RDFs (see **Appendix B**) within greater sage-grouse OHMA. RDFs do not apply outside of greater sage-grouse OHMA.

Appendix G of the Decision lists fluid mineral stipulations in greater sage-grouse habitat. The Proposed Action would comply with applicable stipulations, including:

- SG-08-CSU: limiting noise at leks during the breeding season (March 1 to May 15)
- SG-09-CSU: applying lek buffer distances

Appendix M of the Decision recommends a general protocol for noise measurements in areas of existing and proposed development. The protocol was written to facilitate the gathering of noise measurements relevant to stipulations for greater sage-grouse protection.

The Proposed Action is also in compliance with applicable Special Status Species, Leased Fluid Minerals, and Land Use Authorizations Management Decisions outlined in Section 2.2 of the Decision.

I.5 RELATIONSHIP TO LAWS, REGULATIONS, POLICIES, PLANS, AND OTHER ENVIRONMENTAL ANALYSES

The Proposed Action is consistent with federal laws and regulations; state and local government laws and regulations; and other plans, programs, and policies to the extent practicable within federal law, regulation, and policy. Specific approvals and permits would be required for constructing, operating, and maintaining the proposed geothermal project.

The EA has been prepared in accordance with the following statutes and implementing regulations, policies, and procedures:

- NEPA, as amended (Public Law 91-190, 42 United States Code [USC], Sections 4321 [et seq.]
- 40 CFR, Parts 1500 (et seq.), Regulations for Implementing the Procedural Provisions of NEPA
- Considering Cumulative Effects under NEPA (CEQ 1997)
- 43 CFR, Part 46, Implementation of NEPA of 1969; Final Rule, effective November 14, 2008
- DOI requirements (Departmental Manual 516, Environmental Quality; DOI 2008)
- BLM NEPA Handbook (H-1790 I), as updated (BLM 2008a)
- The Geothermal Steam Act of 1970 (30 USC, Sections 1001-1025)
- 43 CFR, Part 3200, Geothermal Resources Leasing and Operations; Final Rule, May 2, 2007
- The Energy Policy Act of 2005; The National Energy Policy, Executive Order 13212 and best management practices (BMPs) as defined in *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, Fourth Edition* (Gold Book; BLM 2007a)
- The Geothermal Energy Research, Development, Demonstration Act of 1974
- The Federal Land Policy and Management Act of 1976 (Public Law 94 579, 43 USC, Sections 1761 [et seq.]
- Rights-of-Way (ROWs) under the FLPMA and the Mineral Leasing Act (43 CFR, Part 2880), final Rule, April 22, 2005
- BLM Manual 1737, Riparian – Wetland Area Management
- BLM Manual 7240, Water Quality Manual (P)
- BLM Manual 7250, Water Rights Manual (P)
- BLM Manual MS-1794 Mitigation (P)
- The Act of July 31, 1947, as amended (30 USC, Sections 601 et seq.)
- The federal government is authorized to collect fees and to require reimbursement of its costs, as described in Section 304 of FLPMA (43 USC, Part 1734) and the Independent Offices Appropriation Act of 1952 (31 USC, Section 9701)
- September 2, 2016, *Federal Register* Notice 81 FR 60736, Notice of Application for Withdrawal Extension; Notice of Application for

Withdrawal Expansion; and Opportunity for Public Meeting; Naval Air Station, Fallon, Nevada

- August 26, 2016, *Federal Register* Notice 81 FR 58919, Notice of Intent to Prepare an Environmental Impact Statement and to Announce Public Scoping Meetings for the Fallon Range Training Complex Modernization: Expansion of Land Ranges, Airspace Modifications, and Public Land Withdrawal Renewal

The Proposed Action is consistent with State of Nevada, and Churchill and Pershing County ordinances, policies, and plans.

1.5.1 Relationship to Other Environmental Analyses

Multiple environmental analysis documents have been prepared for exploration activities in the Dixie Valley Geothermal Unit Area and for geothermal leasing in this area. These documents are listed below and are incorporated by reference in this document where applicable.

- 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; April 2014 (BLM 2014; <http://bit.ly/1RjhaQx>)
- Ormat Technologies, Inc., Dixie Meadows Geothermal Exploration Project EA, DOI-BLM-NV-C010-2011-0516-EA; January 2012 (BLM 2011a; <http://bit.ly/2lfCZc8>)
- TGP Dixie Development Company, LLC Coyote Canyon and Dixie Meadows Geothermal Exploration, DOI-BLM-NV-C010-2010-0010-EA; May 2010 (BLM 2010; available at the BLM Carson City Office for review during normal business hours)

In 2008, the BLM completed the Programmatic Environmental Impact Statement for Geothermal Resources Leasing in the Western United States (BLM 2008c). This Programmatic Environmental Impact Statement was the foundation for a ROD and Resource Management Plan Amendments for Geothermal Resources Leasing in the Western United States (BLM 2008d). This ROD amended BLM Resource Management Plans, including the CRMP (BLM 2001), to identify public lands that are administratively and legally closed or open to leasing; and to develop a comprehensive list of stipulations, BMPs, and procedures to serve as consistent guidance for future geothermal leasing and development. Special stipulations developed in the ROD were applied to geothermal resource leases subsequently issued by the BLM, including the federal geothermal leases issued to or acquired by Ormat within the Dixie Valley Geothermal Unit Area.

Lease stipulations are summarized in **Section 2.1.6**, Environmental Protection Measures, and full copies of the lease stipulations are attached to this EA as **Appendix A**. ORNI 32 is required to comply with all lease stipulations.

I.5.2 Regulatory Permits and Approvals

The Proposed Action would be subject to other applicable permits listed in **Table 3**, below.

**Table 3
Potential Regulatory Permits and Approvals**

Regulatory Agency	Authorizing Action
BLM and US Navy	Decision Record
BLM and US Navy	Right-of-Way
BLM and US Navy	US Navy Concurrence (if southern gen-tie route is chosen)
BLM	Geothermal Drilling Permit
BLM	Permit to Construct Power Plant
BLM	Geothermal Site License
BLM	Geothermal Commercial Use Permit
Nevada Division of Minerals	Permit to Drill an Oil and Gas and Geothermal Well
Nevada Public Utilities Commission	Utility Environmental Protection Act Permit (if 230-kV gen-tie line is selected)
Nevada Department of Environmental Protection – Bureau of Water Pollution Control	Construction Stormwater Permit and Underground Injection Control (UIC) permit
Nevada Division of Water Resources	Temporary Consumptive Water Use permit
Nevada Bureau of Air Pollution Control	Surface Area Disturbance Permit
BLM, Nevada Division of Historic Preservation and Archaeology	Section 106 compliance with the National Historic Preservation Act
Churchill County	Special Use Permit
Pershing County	Special Use Permit

I.6 DECISION TO BE MADE

The BLM Authorized Officer would decide whether to approve or not approve Ormat's proposed Dixie Meadows Geothermal Utilization Plan. If the Authorized Officer decides to approve the plan, the decision would also need to be made as to which gen-tie route would be approved and what terms and conditions would be applied to the permit. Should the southern gen-tie route be approved, concurrence from the DON would be strongly desired.

CHAPTER 2

PROPOSED ACTION AND ALTERNATIVES

The Proposed Action and Alternative I presented below differ only in the routing of the gen-tie line. Currently, the Proposed Action has lower connection costs, but has other interconnection challenges. The gen-tie proposed under Alternative I is shorter, but has greater costs due to the need for a transformer at the interconnection site. From an economic and transmission interconnection perspective, the northern gen-tie route as described in the Proposed Action is the preferred alternative.

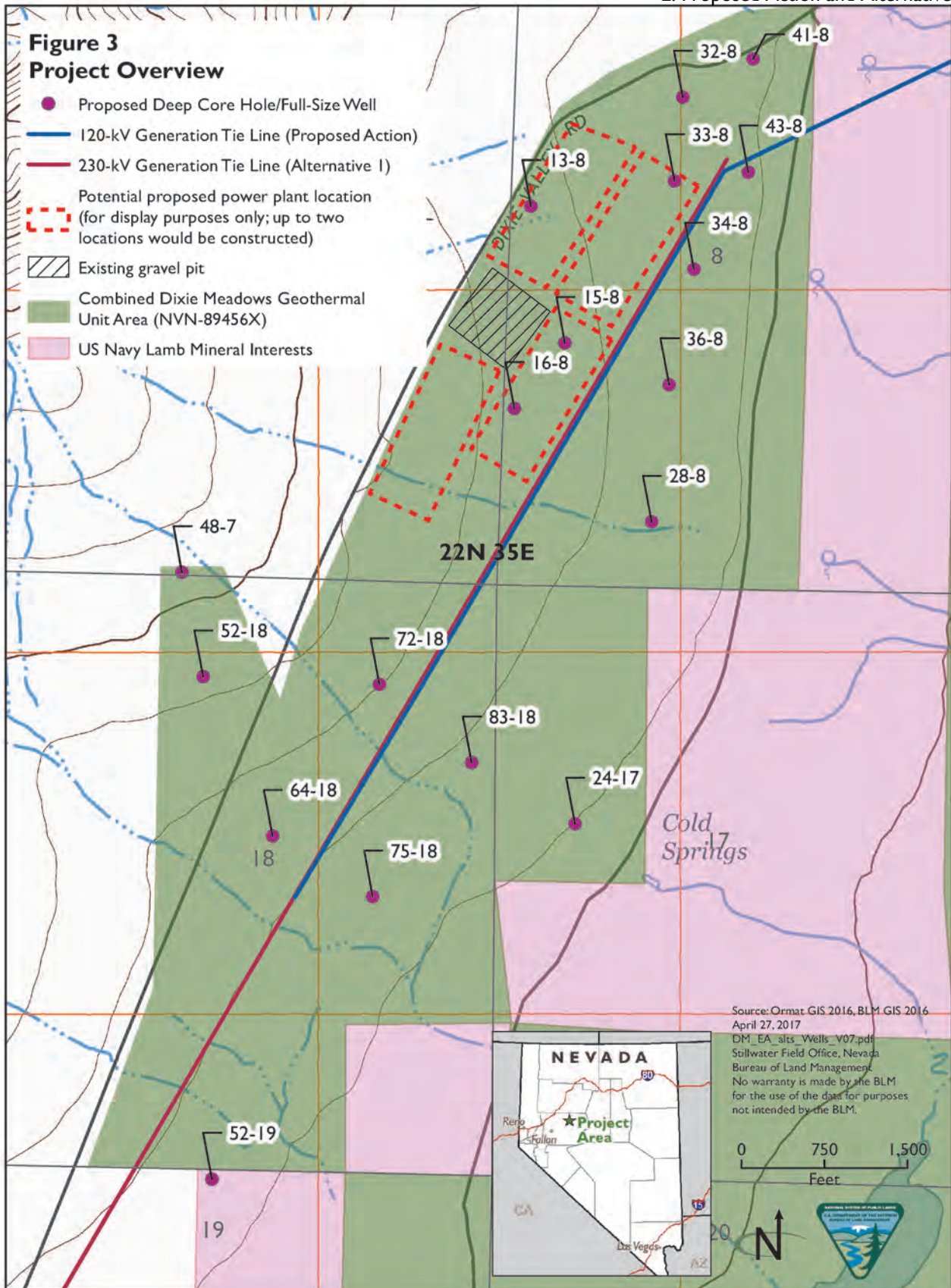
2.1 PROPOSED ACTION (NORTHERN GEN-TIE ROUTE)

The Proposed Action includes the following five components:

- Construction and operation of up to two 30-MW net rated geothermal power plant facilities and associated electrical substations;
- Construction of up to 15 production and injection well pads;
- Construction of up to 8 core hole well pads and 2 water well pads;
- Construction and operation of geothermal production and injection wells, pipelines, access roads, and support facilities; and
- Construction and operation of a 120-kV gen-tie to Ormat's Jersey Valley power plant.

Figure 3, Project Overview, displays the well locations and footprint size of potential power plants. To allow development flexibility, more sites are proposed than would be used. Further, multiple wells may be drilled on a single pad.

Because of its scale, the gen-tie route is displayed in **Figure 4**, Gen-Tie Route – Proposed Action.



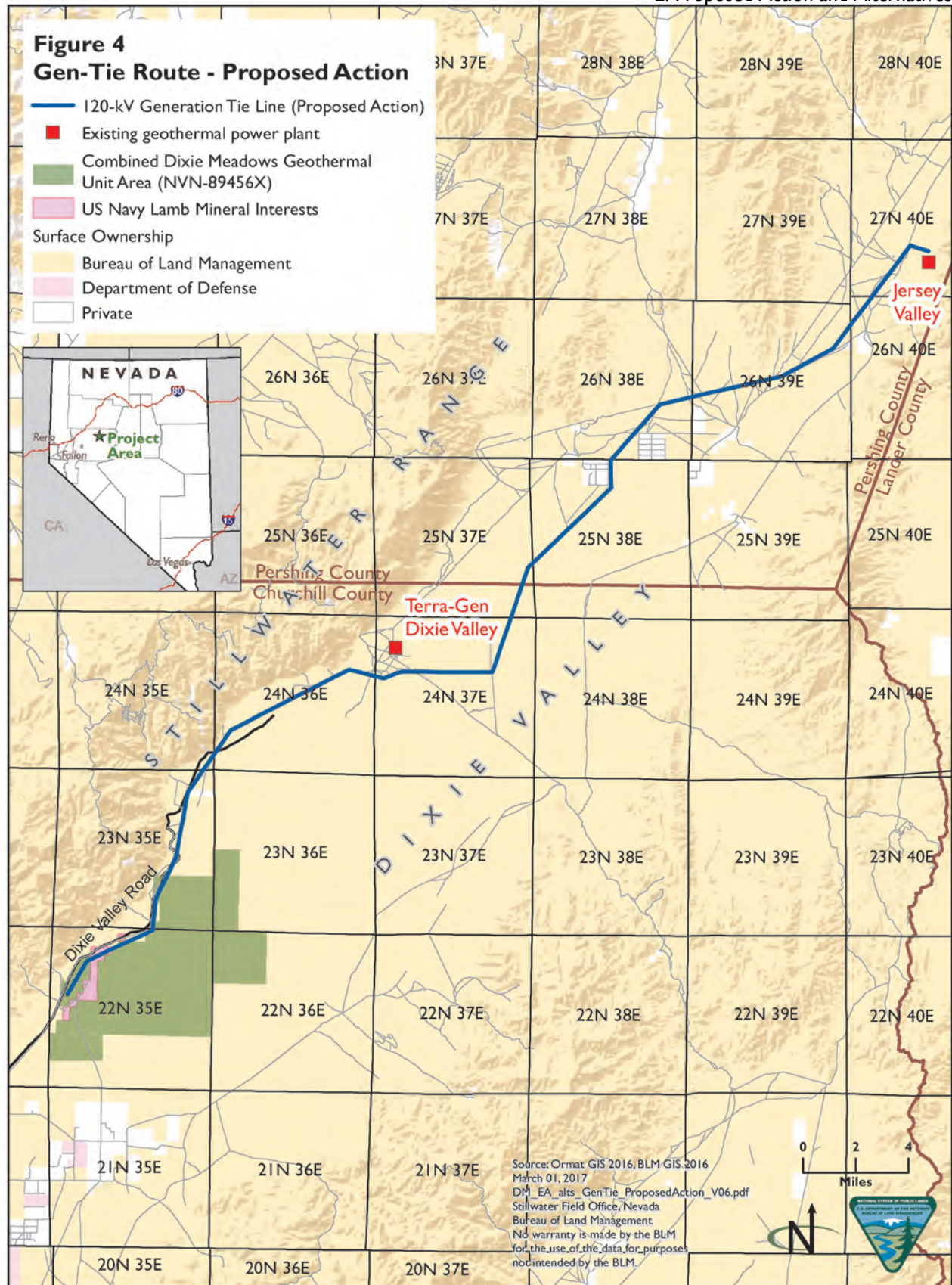


Table 4, Area of Disturbance (Proposed Action), summarizes the proposed new facilities with an estimated area of permanent and temporary disturbance for each facility.

Table 4
Area of Disturbance (Proposed Action)

Disturbance Type	Amount of Disturbance (Approximate Acres)	Amount of Disturbance to Be Reclaimed (Approximate Acres)	Amount of Disturbance that Would Not Be Reclaimed (Approximate Acres)
Production and injection wells	90	45	45
Exploration core holes and water wells	10	5	5
Power plants and substation	64	32	32
Gen-tie	1,778	1,758	20
Access roads/pipelines	40	20	20
Total	1,982	1,860	122

Source: Ormat GIS 2016

ORNI 32 would implement applicable environmental protection and mitigation measures. Throughout project construction and operation, it would comply with geothermal lease stipulations identified in **Section 2.1.6**, Environmental Protection Measures. In addition, the following separate mitigation and contingency plans would be developed to address specific resource issues:

- Aquatic resources monitoring and mitigation plan
- Invasive plant management plan
- Reclamation plan

Existing drilling operation and emergency contingency plans would also be in place, including an injury contingency plan, a fire contingency plan, a spill or discharge contingency plan, and a hydrogen sulfide contingency plan.

To reduce the potential for impacts on birds and bats, a bird and bat conservation strategy (BBCS) has been prepared (see **Appendix C**, Bird and Bat Conservation Strategy).

The proposed project schedule and a detailed description of each component of the Proposed Action are provided in the following sections.

2.1.1 Schedule of Activities

Exploration Wells

The applicant has completed several exploratory wells under previously approved EAs described in **Section 1.2**, Background, and shown in **Figure 2**.

This aspect of the project would follow the process outlined in **Section 2.1.2, Exploration Wells**, and would be performed concurrently with similar exploration activities approved in the 2011 Exploration EA. Drilling as permitted under the Decision Records for the two previous exploration EAs is ongoing to continue evaluating the geothermal resource in the area.

Power Plants and Production and Injection Wells

Construction of the power plants and initial well field facilities would require from 12 to 24 months once all permits are obtained and equipment orders are scheduled. Well construction could occur at any time over the life of the project.

Gen-tie

Construction of the gen-tie line would take approximately 5 months to complete. Construction would commence only after all required permits and authorizations have been secured. Construction would comply with any timing limitations or restrictions imposed for nesting of migratory birds or greater sage-grouse.

2.1.2 Exploration Wells

The Proposed Action includes drilling of up to eight additional exploration wells in the Dixie Meadows Geothermal unit area. The nature of these exploration wells would be similar to the exploration wells that were approved in the 2011 Exploration EA DOI-BLM-NV-C010-2011-0516-EA (BLM 2011a), though the exact locations would be different from those shown in the Exploration EA. Potential locations for exploration wells under the Proposed Action are depicted in **Figure 3**.

Typically, these wells would be core holes which require a smaller drill pad than a full-size production or injection well. Each exploration well would be situated on an approximately 150- by 150-foot drill pad (approximately 0.5 acres) and be drilled using the materials and processes described in the Exploration EA. Drilling an exploration well typically occurs over a period of 4 to 10 weeks, depending on depth, diameter, and resource conditions.

Site Preparation

Drill pad preparation activities would include clearing, earthwork, drainage, and executing any other improvements necessary for efficient and safe operation and fire prevention. Only those drill pads scheduled to be drilled would be cleared. Clearing would include removal of organic material, and vegetation. Topsoil would be salvaged during the construction of all pads and new access roads, as feasible, and stockpiled on the pads for use during subsequent reclamation of the disturbed areas. Stockpiled topsoil would be seeded with a BLM-approved seed mix to ultimately increase reclamation success. Construction of a drill pad takes approximately 1 to 2 weeks to complete.

Fenced reserve pits would be constructed in accordance with BMPs identified in *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development* (Gold Book; BLM 2007a) and the Nevada Department of Wildlife (NDOW) Design Features and Tools to Reduce Wildlife Mortalities Associated with Geothermal Sumps (Geothermal Sump Guidelines; NDOW, no date) on each pad for the containment and temporary storage of water, drill cuttings and waste drilling mud during drilling operations. The reserve pit for exploration core holes would measure approximately 20 feet by 50 feet by 8 feet deep.

Gravel for drill pad and road building material would be obtained through Ormat's mineral material sales contract with the BLM. The gravel pit is located in T22N, R35E, Section 7, SE1/4 NE1/4 and Section 8 SW1/4 NW1/4, Mount Diablo Base and Meridian. This sales contract (N-89405) expired on July 8, 2016, but ORNI 32 is currently in the process of renewing it.

Each drill site, exclusive of the reserve pit, would be covered with approximately 4 inches of gravel. An average of about 6 inches of gravel would be applied to the new access roads, as necessary, to create an all-weather, all-season surface.

Drilling

Each exploration core well would be drilled with a rotary drill rig. During drilling, the top of the drill rig mast could be as high as 50 feet above the ground surface. The typical associated support equipment would include drill pipe, trailers, drill mud, fuel and water tanks, diesel generators and air compressors. Additional equipment and supplies would be brought to the drill site during ongoing drilling and testing operations.

The wells would each be drilled and cased to a design depth selected by the project geologist. Blowout prevention equipment, which is typically inspected and approved by the BLM and the Nevada Division of Minerals (NDOM), would be utilized while drilling below the surface casing. During drilling operations, cool water, salt, or barite (barium sulfate) would be stored at each well site for use in preventing uncontrolled well flow ("killing the well"), as necessary. If water for this purpose is stored in pits, pits would be fenced to prevent wildlife access.

The well bore would be drilled using nontoxic, temperature-stable drilling mud composed of a bentonite clay-water or polymer-water mix. Variable concentrations of standard, approved drilling additives would be added to the drilling mud as needed to prevent corrosion, increase mud weight, and prevent mud loss. Additional drilling mud would be mixed and added to the mud system as needed to maintain the required quantities.

Site Decommission

Following completion of exploration well testing, all drilling and testing equipment would be removed from the site, and interim reclamation would

occur on areas of the well pad not needed for future well monitoring or testing. Interim reclamation would follow interim reclamation standards outlined in Appendix D, Best Management Practices – Mitigation Measures, of the BLM’s 2008 geothermal leasing Programmatic Environmental Impact Statement (PEIS; see **Appendix F**, PEIS for Geothermal Resources Leasing in the Western United States, Appendix D: Best Management Practices and Mitigation Measures). Interim reclamation plans would be developed by ORNI 32 prior to construction. The surface facilities remaining on the site would likely consist only of several valves on top of the surface casing, which would be chained and locked to allow access in case additional testing is desired.

After the well drilling and testing operations are completed, the reserve pits would remain fenced with wildlife-proof fencing materials until all liquids are evaporated. The solid contents remaining in each of the reserve pits, typically consisting of nonhazardous, nontoxic drilling mud and rock cuttings, would be tested after all liquids have evaporated for pH, metals, and total petroleum hydrocarbon or oil and grease concentrations to confirm that they are not hazardous. If the test results indicate that these solids are nonhazardous, the solids would then be dried, mixed with the excavated rock and soil, and buried by backfilling the reserve pit. If any hazardous materials were identified, they would be removed and properly disposed offsite in accordance with all applicable local, state, and federal laws.

Wells determined to have no commercial potential and not needed for monitoring would eventually be plugged and abandoned in conformance with the well abandonment requirements of the BLM and NDOM. Abandonment typically involves filling the well bore with clean, heavy abandonment mud and cement until the top of the cement is at ground level. This ensures that geothermal fluids would not move into the well column and then out into non-geothermal aquifers. The well head and any other equipment would then be removed, the casing cut off well below ground surface, and the hole backfilled to the surface.

Following abandonment of a well, access roads and well pads would be reclaimed. Each well pad and constructed road would be disked and graded, if necessary, to de-compact the soil, turn under any applied gravel, and restore grade, if necessary. Stockpiled and seeded topsoil, if any, would be placed back over the disturbed areas. Disturbed areas would be reseeded with a BLM-approved seed mix.

2.1.3 Power Plants and Ancillary Facilities

The Proposed Action includes construction and operation of up to two approximately 30-MW net rated geothermal power plants. The proposed power plants would be located on approximately 16 acres each (up to 32 acres total) in two candidate locations; the final locations would be dependent upon site-specific engineering considerations, and the four potential locations shown

on **Figure 3** and other figures in this EA are shown to display the scale of each power plant site and the range of candidate plant locations. At either location, an approximately 0.7-acre substation, used to transform generated low voltage electrical energy to the higher voltage required for a transmission line, would be constructed within the power plant boundary.

The most prominent features of the power plant, both in height and mass, would be the air-cooled condensers. They range up to 35 feet in height and are about two thirds the length of the site. The balance of the plant would be an array of pipes, the turbine/generator, and a small building to house electrical equipment. A gated, chain link fence would be installed around the perimeter of each facility in order to prevent unwarranted access to the facility/electrical generation areas by the public and/or wildlife.

All buildings housing the offices, electrical room, control room and auxiliary buildings would be rigid, steel-frame, pre-engineered structures with steel panel walls and a steel roof. The exterior of the buildings would be painted consistent with the BLM's visual color guidelines to blend in with the surrounding area.

A microwave communication tower and antenna would be constructed within each power plant site to deliver signals from control centers and other remote locations, and to report operating status. This network also would provide voice communication from dispatchers to power plant operators and maintenance personnel. The top of the tower would be approximately 75 feet above ground surface. The tower would be painted a BLM-approved color to blend in with the landscape. The tower would provide a microwave communications link from the power plant sites to existing Communications sites within the region. The microwave link would be in the Federal Communications Commission licensed 6 GHz range with actual frequencies determined during the microwave path analysis and Federal Communications Commission frequency coordination. ORNI 32 is coordinating with the US Navy to identify appropriate microwave frequencies and technologies to avoid any interference issues.

An existing mineral material sale contract (NVN-92900) is in the lease area. The proposed plants would be located to not conflict with the mineral material sale contract.

Power Plant Construction

Project construction could require up to 50 workers, although fewer would be on site most of the time during construction, as the construction activities would be staged. Construction of the power plants and well field facilities would take approximately 12 to 24 months to complete once all permits are obtained and equipment orders are scheduled. It is anticipated that most construction workers would reside in the Fallon, NV area.

Upon BLM approval, initial site preparation would commence with grubbing and clearing of the utilization area. Following grubbing and clearing, topsoil would be removed and stockpiled for later use in revegetation and reclamation. Stockpiled topsoil would be seeded with a BLM-approved seed mix to ultimately increase the potential for reclamation success. Since the topography of all site options is relatively flat, it is anticipated that minimal cutting of slopes would be required. If material generated from cutting slopes does not provide the required amount of fill material, fill could be obtained from the BLM gravel pit described in **Section 2.1.2**.

Any fill slopes constructed would be 2:1 or flatter as necessary and would be compacted and maintained to minimize erosion and provide slope stability. The proposed power plant equipment and structures would be situated on conventional spread footings, except the area beneath the turbine and generator, which may require additional support from pilings. Further geotechnical studies would determine what type of foundation may be required beneath these units.

During construction, a portion of the power plant sites and adjacent well pads would be devoted to equipment and materials laydown, storage, construction equipment parking, small fabrication areas, office trailers and parking. Equipment and materials laydown space is required for large turbine parts, structural steel, piping spools, electrical components, switchyard apparatus, and building parts.

Most access roads would be constructed during the exploration activities. The power plants and associated structures would be situated if possible along these access roads, which would limit new access road construction. All access roads, laydown areas, and parking areas would be provided with a gravel surface after grading, which would inhibit sediment runoff from the surface.

Ancillary facilities and power plant components that would be constructed on the power plant pads include offices, restrooms, the electrical room and control room; maintenance building; condensing fan equipment; geothermal fluids containment basin; electrical substation and other smaller, ancillary structures.

Temporary utilities would be provided for the construction offices, the laydown area, and the power plant site. Temporary construction energy would be supplied by a temporary generator and, if available when the transmission line is completed, at the site by utility-furnished power. Area lighting, drinking water, and portable toilets and sanitations would be implemented. Use of nighttime lighting during construction would be minimized to the extent possible to comply with Dark Sky Initiative lighting practices and to reduce impacts on the US Navy's Night Vision Device aircraft operations. During construction, ORNI 32 would maintain adequate obstruction lighting to any construction equipment that project above 40 feet.

Power Plant Operation

The power plants would utilize a binary design with an air-cooled heat rejection system. The geothermal fluid would flow through the binary power plant in a closed system. The geothermal fluids for the binary power plants would be produced from the production wells by pumping. Once delivered to the power plant, the heat in the geothermal fluid would be transferred to the “binary” (or secondary) fluid in multiple-stage, non-contact heat exchangers. Depending on the temperature of the geothermal fluids, the binary turbine units would use either pentane (C₅H₁₂), or butane (C₄H₁₀; or similar isomers) - all flammable but nontoxic hydrocarbons - as the binary fluid, which circulates in a closed loop. The heat from the geothermal fluid vaporizes the binary fluid, which turns the binary turbine and electrical generator to make electricity. The net power generation, motive fluid, and type of cooling technology would be dependent on the temperature and pressures of the geothermal fluids.

The vaporized binary fluid exits the turbine and is condensed back into a liquid in a non-contact, air-cooled condenser. The condensed binary fluid is then pumped back to the heat exchangers for reheating and vaporization, completing the closed-loop cycle.

After exiting the heat exchangers, the cooled geothermal fluid is pumped to the geothermal injection wells through the injection pipelines, and injected back into the geothermal reservoir.

Based upon data from other Ormat facilities, the total geothermal fluid production rate for each Dixie-Meadows facility would be up to about 6.4 million pounds per hour per plant (14,000 gallons per minute [gpm] per plant) at an average temperature of 300°F. Production well flow rates are expected to range from approximately 2,000 to 3,000 gpm per well, based on five or six production wells. The total estimated geothermal production rate could increase or decrease. This would depend on the number of production wells that are installed and the observed geothermal fluid temperature and production rate at each well.

All the geothermal fluid brought to the power plants would be injected back into the geothermal reservoir. The injection pressure, and the volume injected per well, would depend on the permeability of each well's injection zone. The total estimated injection rate into the injection wells would be similar to the production rate, but slightly lower volume due to fluid contraction due to cooler temperatures (typical minimum temperature of 150° to 170°F). Injection rates would depend on the final number of injection wells installed, as well as the permeability of each well's injection zone.

Lighting used during operation of the power plant and all ancillary facilities would be minimized, motion controlled to the extent possible, and downward facing to minimize impacts on the US Navy's Night Vision Device aircraft operations.

Substation Construction

Each power plant would include an electrical substation at which electrical power generated at 12.47-kV would pass through a transformer to increase the voltage to 120-kV. Each substation would include a 12.47-kV circuit breaker to protect the electric generators, potential and current transformers for metering and system protection, and a circuit breaker to protect the substation. A main control building would contain instrumentation and telecommunications equipment.

The substations would measure up to 200 feet by 150 feet each and would be surrounded by an 8-foot-tall chain link fence with vehicle and personnel access gates. The surface of the substations would be covered by gravel and the substation equipment would be placed onto concrete foundations.

Work at the substation sites would begin by clearing existing vegetation and grading a level pad for installation of the substation. Once the pad is prepared, the site would be secured with chain link fencing. Once the equipment is installed, pit run gravel would be spread over the site to a depth of approximately 4 inches. Gravel for each plant's transformer site would be obtained through Ormat's existing mineral material sales contract with the BLM, as described in **Section 2.1.2**, under Site Preparation.

Substation construction is anticipated to mirror the power plant construction timeline. Construction would commence only after all required permits and authorizations have been secured.

Substation Operation

Once the substation and associated facilities are operational and in-service, operations and maintenance personnel would maintain the proposed transmission system by monitoring, testing, and repairing equipment.

Site Decommission

At the end of project operations all aboveground facilities and areas of surface disturbance associated with geothermal development would be removed and reclaimed. Ultimately, ORNI 32 would implement a site reclamation plan in conformance with reclamation standards outlined in Appendix D, Best Management Practices – Mitigation Measures, of the BLM's 2008 geothermal leasing PEIS (see **Appendix F**). A reclamation plan would be developed by ORNI 32 prior to construction. The plan would address restoring the surface grades, surface drainage, and revegetation of cleared areas. Stormwater diversion would remain in place until successful revegetation is attained.

2.1.4 Production Wells, Pipelines, Access Roads, and Support Facilities

The number of geothermal production and injection wells required for the project principally depends on the observed productivity (or injectivity) of the wells and the temperature and pressure of the produced geothermal fluid; therefore, it is not known at this time the precise number and location of production and injection wells that would be required. Full-size wells drilled at

locations shown on **Figure 3** would be assigned production or injection status, as productivity or injectivity of the wells is observed during exploration.

Production wells produce geothermal fluid that is pumped through pipelines to the power plants. Injection wells are used to return the geothermal fluid from the power plants to the geothermal reservoir. Injection ensures the longevity and renewability of the geothermal resource.

ORNI 32 is proposing up to 15 production and injection well pads, all located within the Dixie Meadows Geothermal Unit on BLM-administered or US Navy lands. The well locations are tentative and may need to be adjusted as additional geologic, geophysical, and geothermal reservoir information is obtained as new wells are drilled and tested; therefore, well pads are not depicted graphically. Full-size wells may be drilled on the same well pads used for exploration. To allow development flexibility, more proposed well sites are proposed and shown on **Figure 3** than would actually be drilled.

The proposed well sites and selected attributes are listed in **Table 5**, Proposed Wells. The coordinates provided in this table are estimates of the actual location; wells may be sited in a slightly different location, but would remain within the same Kettleman number as shown in the table.

Geothermal Well Drilling and Testing

A detailed geothermal drilling program would be submitted to the BLM or US Navy, as appropriate, for review and approval prior to beginning drilling operations. This section summarizes the well drilling activities for purposes of evaluating potential environmental consequences. If necessary, the BLM may include additional provisions or conditions needed to address environmental concerns or other site-specific issues with the geothermal drilling permit.

Production/Injection Well Pad Layout and Design

Each production and injection well pad would cover an area approximately 350 feet by 375 feet, or approximately 3 acres. Drill pad preparation activities would include clearing, earthwork, drainage and other improvements necessary for efficient and safe operation, and for fire prevention.

Drill sites would be prepared to create a level pad for the drill rig and a graded surface for the support equipment. Fenced reserve pits, or sumps, would be constructed as described in **Section 2.1.2**, under Site Preparation.

ORNI 32 would obtain a Construction Stormwater Permit from the Nevada Division of Environmental Protection (NDEP), which includes a Stormwater Pollution Prevention Plan. In compliance with the Construction Stormwater Permit, stormwater runoff from undisturbed areas around the constructed drill pads would be directed into ditches surrounding the drill pad and back onto undisturbed ground consistent with BMPs. In addition, the site would be graded to prevent stormwater runoff from the pad.

**Table 5
Proposed Wells**

Kettleman Well Number	UTM Coordinates ¹		Well Type ²
	Easting	Northing	
Lamb Mineral Interests			
52-19	406702	4402543	Deep core hole/full-size well
Lease Number N-60686 T22N; R35E			
83-18	407420	4403693	Deep core hole/full-size well
24-17	407705	4403526	Deep core hole/full-size well
75-18	407147	4403323	Deep core hole/full-size well
Lease Number N-83934 T22N; R35E			
28-8	407917	4404359	Deep core hole/full-size well
36-8	407966	4404738	Deep core hole/full-size well
Lease Number N-92479 T22N; R35E			
43-8	408226	4405326	Deep core hole/full-size well
41-8	408196	4405642	Deep core hole/full-size well
32-8	408003	4405533	Deep core hole/full-size well
34-8	408034	4405058	Deep core hole/full-size well
33-8	407981	4405302	Deep core hole/full-size well
13-8	407584	4405232	Deep core hole/full-size well
16-8	407538	4404672	Deep core hole/full-size well
48-7	406589	4404328	Deep core hole/full-size well
15-8	407678	4404853	Deep core hole/full-size well
72-18	407164	4403909	Deep core hole/full-size well
52-18	406677	4403931	Deep core hole/full-size well
Lease Number N-92717 T22N; R35E			
64-18	406869	4403491	Deep core hole/full-size well

Source: Ormat GIS 2016

¹ Coordinates are in NAD1983 UTM 11N (meters)

² Well types are as follows:

- Core holes are wells that are drilled using a hollow drill bit; whole rock samples (cores) can be extracted from wells drilled this way
- Deep core holes are cores drilled to a relatively greater depth
Full-size wells are drilled to a wider diameter than core holes, allowing for either production or injection use, depending on observed well characteristics
- Monitoring wells are wells used for monitoring various characteristics of water resources

Each well would be drilled with a large rotary drill rig. During drilling, the top of the drill rig mast could be as much as 170 feet above the ground surface. The typical drill rig and associated support equipment, including trailers, compressors, drill pipe, mud systems and other large equipment, would be brought to the prepared pad on 25 or more, large tractor-trailer trucks. Additional equipment and supplies would be brought to the drill site during ongoing drilling and testing operations. During drilling, ORNI 32 would maintain adequate obstruction lighting on any construction equipment or drilling rigs that project above 40 feet. ORNI 32 would notify NAS Fallon before setting up the

drill rig. This is to ensure that lighting is compatible with the US Navy's Night Vision Device aircraft operations and to avoid potential conflicts with low-flying aircraft.

Reserve pits would be constructed in accordance with BMPs identified in the BLM Gold Book (BLM 2007a) and NDOW Geothermal Sump Guidelines (NDOW, no date) on each pad for the containment and temporary storage of water, drill cuttings and waste drilling mud during drilling operations. The reserve pit for exploration core holes would measure approximately 75 feet by 250 feet by as many as 10 feet deep. Reserve pits would be used until the associated wells are plugged and abandoned.

Drilling would be conducted 24-hours per day, 7-days per week by a crew of nine to ten workers. During short periods, the number of workers on site during drilling could be as high as 18. Drilling at each full-size well would be expected to last approximately 1 to 2 months on average.

Water required for well drilling could range up to 75 gpm. Water necessary for these activities would likely be obtained from shallow water wells drilled from one or more of the proposed drill sites as approved by the BLM and under a waiver for the temporary use of groundwater from the Nevada Division of Water Resources (NDWR). Other private wells in the valley could also supply the water.

Following construction, an approximately 15-foot by 15-foot by 10-foot high motor control building would be located on the well pad within approximately 50 feet of each production well to house and protect the auxiliary well control systems, motor switch gear controls and sensors, transmitters, and geothermal fluid treatment systems. The well control systems, data transmitters and geothermal fluid treatment systems used for the injection wells would be placed inside a smaller structure located on the injection well pads.

Well Drilling

The wells would each be drilled and cased to a design depth selected by the project geologist. Blowout prevention equipment, which is typically inspected and approved by the BLM and NDOM, would be utilized while drilling below the surface casing. During drilling operations, cool water, salt, or barite would be stored at each well site for use in preventing uncontrolled well flow (killing the well), as necessary.

The well bore would be drilled using nontoxic, temperature-stable drilling mud composed of a bentonite-water or polymer-water mix for all wells. Variable concentrations of approved drilling additives would be added as needed to prevent corrosion, increase mud weight, and prevent mud loss. Additional drilling mud would be mixed and added to the mud system as needed to maintain the required quantities. Fenced reserve pits on each pad would contain water, drill cuttings, and waste drilling mud during drilling operations.

In the event that very low pressure areas are encountered, compressed air may be added to the drilling mud, or used instead of drilling mud, to reduce the weight of the drilling fluids in the hole and assist in carrying the cuttings to the surface. Additionally, each well may need to be worked over or redrilled if mechanical or other problems are encountered while drilling or setting casing that prevent proper completion of the well in the targeted geothermal reservoir, or if the well does not exhibit the anticipated permeability, productivity or injectivity. Depending on the circumstances encountered, working over a well may consist of lifting the fluid in the well column with air or gas, or stimulation of the formation using dilute acid or rock fracturing techniques. Well redrilling may consist of reentering and redrilling the existing well bore; reentering the existing well bore and drilling and casing a new well bore; or sliding the rig over a few feet on the same well pad and drilling a new well bore through a new conductor casing.

Flow Testing

Following well construction, and while the drill rig is still over the well, the residual drilling mud and cuttings would be flowed from the well bore and discharged to the reserve pit. This may be followed by one or more short-term flow tests. Each test would consist of flowing fluid from the well while monitoring geothermal fluid temperatures, pressures, flow rates, chemistry and other parameters. An “injectivity” test may also be conducted by injecting the produced geothermal fluid into the well and the geothermal reservoir. The drill rig would likely be moved from the well site following completion of these short-term tests.

Long-term flow tests (five days or more) of each well drilled could be conducted following the short-term flow tests to more accurately determine long-term well and geothermal reservoir productivity. Two or more wells could be used during these tests.

Emergency Contingency Plans

Existing drilling operation emergency contingency plans, including an Injury Contingency Plan, a Fire Contingency Plan, a Spill or Discharge Contingency Plan, and a Hydrogen Sulfide Contingency Plan, would all be implemented to mitigate health risks and increase overall safety for the project. Additionally, ORNI 32 would collaborate with local public services, including fire, police, and ambulance throughout the duration of the project.

Geothermal Fluid Pipelines

Pipelines would bring the geothermal fluid from the production wells to the power plants and deliver the cooled geothermal fluid from the power plants to the injection wells. Pipeline routes generally follow the shortest distance from each well pad to the next well pad or the power plant in order to minimize the amount of pipe required, reduce heat losses and the energy required to move the fluids, and minimize the amount of ground disturbance. In addition, the

proposed pipeline routes generally follow existing or proposed roads to facilitate ongoing monitoring and future maintenance. However, the final alignment of the pipeline routes would be dictated by the specific wells completed for the project and the need to match fluid characteristics and balance fluid volumes in these pipelines.

Pipeline Construction

The construction of the aboveground pipelines would require grading of the pipeline corridor. Pipeline construction would begin with auguring holes for pipe supports, which would be pre-fabricated off site and set into concrete. While the concrete is curing, the approximately 40-foot long steel pipe sections would be delivered and placed along the construction corridor. A small crane would lift the pipe sections onto the pipe supports and temporary pipe jacks so that they could be welded together into a solid pipeline. Once welded and the welds tested, the pipe would be jacketed with insulation and an aluminum sheath (appropriately colored, as determined by BLM, to blend with the area).

At access road crossings, the pipeline would be buried in a trench using a pipe sleeve. Horizontal, or vertical expansion loops would locally be constructed. When completed, the top of the new geothermal pipelines would average three feet (and up to six feet) above the ground surface. Electrical power and instrumentation cables for the wells would then either be installed in steel conduit constructed along the same pipe sleepers or hung by cable from pipe along the pipeline route.

Water Requirements

During construction of the power plants and pipelines, ORNI 32 would need water for dust control, soil compaction, and miscellaneous uses. An estimated total of 17.6 acre-feet would be used throughout a 1-year construction period. ORNI 32 does not have water rights.

Water required for construction would likely be obtained from up to two water wells that would be constructed on BLM land north of the plants, at a site to be determined after approval by the BLM. Both Ormat and TGP were previously permitted the installation of temporary non-potable water wells for drilling and construction water, but the wells were never constructed. ORNI 32 would obtain a waiver from the Nevada State Water Engineer (NDWR) to install and use the wells. Each water well would be situated on a pad approximately 150 feet by 150 feet in size (approximately 0.5 acres) and be drilled using the materials and processes described in the Exploration EA.

Alternatively, if a water source cannot be located, water may be obtained from a US Navy well or other private wells located several miles to the south, pending landowner approval. This water would be trucked to the construction site.

Following construction, facility water needs would include water for the fire pump system, general maintenance water, and water for the domestic water system, and would be approximately 2.5-3.0 acre-feet per year throughout the life of the project. A well may be completed at one or both plant sites that would only be used for the domestic purposes. Based on test results from the sites existing monitoring well, area groundwater is expected to be non-potable water, with high levels of dissolved solids. The domestic water would undergo basic treatment with chlorination to prevent bacterial growth, but it would not be treated to meet drinking water quality standards. Drinking water for on-site personnel would be provided from bottled water.

Portable toilets would be provided throughout the site during construction, but a septic system would be installed at the main office building.

Operation of the air-cooled geothermal plants is not anticipated to consume geothermal water resources. This is because all geothermal fluid used in production would be reinjected into the geothermal reservoir; therefore, augmenting the geothermal reservoir by injecting basin-fill water (Benoit et al. 2000) or other water is not anticipated to be necessary.

Water required for decommissioning of the project, including earthwork and reclamation, is estimated to be 13.6 acre-feet. This water would also be obtained from the construction well, via a waiver from the Nevada State Water Engineer, and trucked to the project sites where needed.

Site Access and Road Construction

Primary site access is by driving about 40 miles east from Fallon on US Highway 50 and then north on State Highway 121 (Dixie Valley Road) for approximately 36 miles.

The number of miles of new access roads constructed would depend on well pad configuration, but total surface disturbance would not exceed 20 acres. Road beds would be constructed using a dozer and/or road grader. An average of 6 inches of gravel would be put on the road beds.

Constructed access roads crossing existing drainages may require installation of culverts. Culvert installation would follow BLM design criteria and would be constructed pursuant to standards established in the Gold Book (BLM 2007a).

Surface Reclamation

Once drilling is complete, the shoulders of the pads could be reclaimed, but the majority of the pad must be kept clear for ongoing operations and the potential need to work on or re-drill the well. The portions of the cleared well sites not needed for operational and safety purposes would be recontoured to a final or intermediate contour that would blend with the surrounding topography as much as possible. Areas to be reclaimed would be ripped, tilled, or disked on

contour to relieve compaction, covered with stockpiled topsoil, and seeded with a BLM-approved, weed-free seed mix.

At the end of Project operations, the wells would be plugged and abandoned in compliance with BLM and NDOM regulations. Abandonment typically involves filling the well bore with heavy abandonment mud and cement until the top of the cement is at ground level, which is designed to ensure that fluids would not move across geologic barriers into different aquifers. The well head and any other equipment would then be removed, the casing cut off below the ground surface, and the hole backfilled to the surface.

Pipeline reclamation would include pipeline removal and cutting off support posts flush with the ground surface.

Access road interim reclamation would consist of reclaiming portions of the road not needed for vehicle travel. The site is relatively flat, but if present, cut slopes, fill slopes, and borrow ditches may be reseeded to restore habitat, forage, and scenic resources, and to reduce soil erosion and maintenance costs. Final reclamation would include recontouring the road back to the original contour, seeding, and controlling noxious weeds, and may also include other techniques to improve reclamation success such as ripping, scarifying, replacing topsoil, constructing waterbars, mulching, redistributing woody debris, and barricading.

2.1.5 Gen-Tie

This alternative includes the construction and operation of an overhead 120-kV gen-tie and associated facilities that would be routed northeasterly to Ormat's Jersey Valley power plant.

Route Description

The 120-kV gen-tie would extend about 48.1 miles in a northeasterly direction from the proposed Dixie Meadows Geothermal power plants to Ormat's existing Jersey Valley Geothermal Power Plant (see **Figure 4**).

A separate geothermal power plant, known as the Dixie Valley (Terra-Gen) Power Plant, is present about 16 miles north of the Dixie Meadows Project Area. An existing, 230-kV power transmission line extends to the south from that power plant and through the Dixie Meadows Project Area. This transmission line cannot be used by the Dixie Meadows project because there may not be adequate capacity for the proposed Dixie Meadows project and the line's owner is reserving any available capacity for their own future use, so a separate transmission line is required. The Dixie Meadows transmission line would be installed parallel to, and east of, the Terra-Gen transmission line up to their plant site. The distance between the two power lines would range from 90 feet (near the Dixie Meadows site) to 250 feet (closer to the Terra-Gen plant). The proposed transmission line would closely parallel Dixie Meadows Road for approximately half of this length.

Just south of the Terra-Gen power plant, the Dixie Meadows line would completely diverge from the Terra-Gen line and continue another 31 miles in an east or northeasterly direction until it reaches the Jersey Valley geothermal power plant. This segment would largely parallel existing gravel roads.

From the Jersey Valley facility, power would be transmitted along the existing Jersey Valley power line to the NV Energy regional power line located at Bannock.

Depending on the exact location of the proposed Dixie Meadows power plants, the entire gen-tie route would be located on BLM-administered land and potentially a portion of US Navy lands. No private property would be affected.

Components

The gen-tie would consist of a single 120-kV circuit using 397.5 MCM aluminum conductor steel-reinforced (ACSR) “Ibis” and optical ground wire. Overhead conductors would be non-specular to reduce sunlight reflection and minimize impacts on visual resources. The gen-tie would use direct-burial, self-supporting wooden monopole structures. Structure heights would be 55 to 70 feet with a span between 300 and 450 feet, depending on the terrain. Poles would include tangent, angle and dead-end types. The diameter at the base of the structure would range from 2 to 3 feet. Structure sites would include assembly and crane-landing areas.

Each structure would carry a single overhead ground wire/fiber optic cable for lightning protection and fiber optic communications. The overhead ground wire measures approximately 0.75 inches in diameter and is constructed of concentric layers of galvanized steel wires surrounding a hollow core which contains 12 to 48 fiber optic strands (depending on final requirements). Metering and communications equipment would be present at each generator site.

ROW Width Requirements

The gen-tie would require a 90-foot-wide ROW during operation. An additional 210-foot-wide short-term ROW, for a total ROW width of 300 feet, would be required to accommodate construction activities.

Construction, Operation, and Decommissioning

A crew of up to 7 workers would begin working at the site approximately 1 to 2 weeks prior to the start of construction. During this time, they would transport equipment and construction materials to the project site laydown area. There are three potential locations for the laydown area used for temporary storage of equipment needed to construct the gen-tie: the power plants site, existing well pads, or an unused Jersey Valley well pad. The laydown area would not be in wetland or riparian areas. Construction water would be obtained from geothermal fluid, a facility water supply well (if installed), or from other private or US Navy-owned wells.

The initial activity prior to construction would be the engineering survey and staking of project facilities. This would include marking structure locations, anchor sites, staging and material yards, wire setup sites, and the substation and switching station location. The site would be staked, and preconstruction plant and wildlife surveys would occur to delineate any sensitive resource areas.

Existing roads would be utilized whenever possible to access the ROW. In areas where no reasonable access roads exist, ORNI 32 would utilize overland travel to access the ROW. If overland travel is required in riparian or wetland areas, every effort would be made to limit overland travel to the late fall or early winter. This is when most plant and wildlife species are dormant and water levels are low.

In order to establish work areas where poles and conductors would be installed, vegetation clearing and minimal grading within the ROW could be necessary. Vegetation removal would be minimized to the extent possible.

In order to stage equipment and conduct work, the structure work areas and stringing sites would require a relatively flat surface. Therefore, the areas could be graded, and gravel or soil could be imported to achieve the necessary elevation. Any gravel would be obtained through a mineral material sales contract with the BLM, as described in **Section 2.1.2**, under Site Preparation.

At each structure site, work areas would be required to facilitate the safe operation of equipment and construction operations. Construction laydown areas would be located in previously disturbed areas whenever possible (i.e., along access roads or on well pads) and would not be in wetland or riparian areas. At each location, a work area would be cleared and leveled, if necessary. In relatively flat terrain, this would not be needed. Structure pieces would be delivered to the laydown area where workers would assemble the pole and attach insulators and hardware. The pole would be erected using a crane from the staging area. After construction, the laydown area would be reclaimed and restored with the exception of a 20-foot by 30-foot pad on both sides of the gen-tie, which would be used for future maintenance of the structure as necessary.

Work areas would be cleared of vegetation only to the extent necessary. Access would be overland travel, and structures would be assembled in relatively level areas without the need for blading. After construction, all work areas not needed for ongoing operation and maintenance needs would be recontoured to match the surrounding terrain, decompacted, and seeded. BLM-approved, weed-free seed mixes would be applied to these areas. Work areas would not be in riparian or wetland areas.

Temporary material storage yards would be required for construction materials. These staging areas would be located at existing well pads, or within the power plants sites, and would serve as reporting locations for workers, parking spaces

for vehicles, and storage spaces for equipment and materials. Structural materials such as structure steel, hardware, foundation material, spools of conductor, and shield wire, would be hauled by truck into the yard. A crane or forklift would be required to unload and transport the materials. Construction materials would be delivered by truck from the yard to the lay down areas. From these areas, materials would be brought to structure sites as needed. Crews would load the material required for the workday, thus limiting the weight hauled on the access roads. This would limit the impact and rutting on access roads caused by heavy vehicles.

Materials, such as gen-tie poles, insulators, hardware, and guy wire anchors, would be delivered from the laydown area to each gen-tie structure site. Assembly crews would attach insulators, travelers, and hardware to form a complete structural unit. The wooden monopole structures would require a temporary workspace of up to 300 feet by 300 feet and a 30-foot by 40-foot area for line construction equipment. Erection crews would use a large, truck-mounted mobile crane to place the structures directly into the ground, depending on the soil conditions and results of geotechnical surveys. The poles directly embedded in the ground would be set in holes that are approximately 3 feet wide and 10 feet deep. These holes would be backfilled with native or imported materials. Guy wires to support the angle poles would be used to keep the structures vertical. As a safety precaution, guy wires would be made more visible if they cross over designated access roads. Signs, flagging, or other markings would be used to indicate the presence of guy wires. Upon construction completion, disturbed portions of the 210-foot-wide short-term ROW would be revegetated with a BLM-approved, weed-free seed mix.

Conductor and shield wire would be delivered on reels by flatbed truck to the various conductor pulling sites along the ROW. Other equipment required to install the conductor would include reel stringing trailers, tensioning machines, pullers, and several trucks including a bucket truck.

The conventional method for installing conductor and shield wire is to pull out a sock line or “pullrope” along the route of the line and manually lift the rope into stringing sheaves. The rope is brought to a puller at one end and a tensioner on the other end. The tensioner holds the wire reels and maintains enough tension to keep the wire off the ground and vegetation while the puller pulls the wire through the stringing sleeves. This method may require some overland travel between structures. When overland travel is required for this purpose, an all-terrain vehicle or similar type vehicle would be used. If overland travel is required in riparian or wetland areas, every effort would be made to limit it to the late fall or early winter. This is when most plant and wildlife species are dormant and water levels are low.

Temporary guard structures would be installed to ensure that the conductors do not drop into the road or other locations that could result in a safety hazard.

Splicing would occur between conductor spools. After the conductors are pulled in, conductor tension would be adjusted to properly sag the conductors. The conductors would then be clipped to the insulators and the stringing roller wheels removed.

Sites for tensioning equipment and pulling equipment are typically approximately 300 feet by 300 feet in size. Typically, conductor pulling sites for stringing the conductor would be spaced at 15,000 to 20,000 foot intervals. However, distances between each site would vary depending on the geography, topography, and environmental sensitivity of the specific area; the length of the conductor pull; and, equipment accessibility. Pulling sites would require a temporary working area. At each pulling site, stringing equipment would be set up approximately 250 feet from the initial structure for leveraging the conductor pull safely. At angle structure pulling sites, the stringing equipment must also be 250 feet from the poles, or up to 100 feet outside of the 300-foot temporary ROW boundary (assuming the power line is centered within the ROW). However, the stringing equipment would be present within the 500-foot-wide zone centered on the ROW alignment that has been surveyed for biological and cultural resources. These sites would not be in riparian or wetland areas.

Emergency maintenance, such as repairing downed wires during storms and correcting unexpected outages, would be performed by ORNI 32 or licensed maintenance contractors.

Waste materials and debris from construction areas would be collected, hauled away, and disposed of at approved landfill sites. A covered portable dumpster would be kept on site to contain trash.

After construction is complete, all existing roads would be left in a condition equal to or better than their preconstruction condition, as directed by the BLM, as applicable. Additionally, all other areas disturbed by construction activities would be recontoured to match the surrounding terrain, decompacted, and seeded. BLM-approved, weed-free seed mixes would be applied to these disturbed areas. Cleared vegetation would be shredded and distributed over the ROW as mulch and erosion control, or disposed of off-site depending on agency agreements. ORNI 32 vehicle access to seeded areas would be restricted until achievement of reclamation success criteria.

Restoration and Reclamation

The electrical equipment and monopoles are anticipated to have a lifetime of approximately 50 to 60 years or more depending upon maintenance operations and climatic conditions. During restoration and reclamation, poles, conductors, and hardware associated with the gen-tie would be removed. The remaining holes would be filled with soil gathered from the immediate vicinity. The areas where the poles were removed would be raked to match the surrounding

topography. Bladed areas would be recontoured and seeded with the appropriate weed-free seed mix.

2.1.6 Environmental Protection Measures

All construction, operation, and maintenance activities associated with the project would be conducted in compliance with all relevant federal, state, and local regulations and permits, and would also be conducted in accordance with the requirements and conditions specified in the lease stipulations. In addition to the requirements stipulated in the project leases summarized below (see **Appendix A** for full stipulations), ORNI 32 has committed to implementing environmental protection measures that would further facilitate avoidance or minimization of potential adverse environmental impacts.

ORNI 32 proposes the following specific environmental protection measures:

1. Portable chemical sanitary facilities would be available and used by all personnel during periods of well drilling and/or flow testing, and construction. These facilities would be maintained by a local contractor.
2. Water would be applied to the ground during the construction and utilization of the drill pads, access roads, and other disturbed areas as necessary to control dust.
3. Prior to construction, ORNI 32 would submit to the BLM an invasive plant management plan to monitor and control noxious weeds, and to ensure that there would be no net increase in the amount of weeds onsite during the life of the project. If any infestations of noxious weed species are discovered along the interconnection line route during construction, their location would be communicated to the CCD, Stillwater Field Office weed coordinator.
4. All construction and operating equipment would be equipped with applicable exhaust spark arresters. Fire extinguishers would be available in all vehicles and equipment on the active sites. Water that is used for construction and dust control would be available for firefighting. Personnel would be allowed to smoke only in designated areas, and they would be required to follow applicable BLM regulations regarding smoking.
5. Cut and fill activities would be minimized through the selection of the power plant sites and pipeline routes. Offsite stormwater would be intercepted in ditches and channeled to energy dissipaters as necessary to minimize erosion around the power plants. To minimize erosion from stormwater runoff, access roads would be maintained consistent with the BMPs applicable to development roads. BLM BMPs for stormwater would be followed, as applicable, on public lands.

6. Avoid known eligible and potentially eligible cultural resource sites through design, construction, and operation of the project.
7. A 30-meter buffer zone would be established around eligible and potentially eligible cultural resource sites to help provide protection to the sites, through project design, construction, and operation. The Proposed Action would not encroach into the established 30-meter buffer zone.
8. The project facilities would be operated in a manner consistent with the engineered design to prevent problems associated with runoff that could affect adjacent cultural sites. This includes the use of acceptable erosion control methods that are applicable to the site conditions.
9. Where the installation of project facilities could impact eligible or potentially eligible cultural sites, ORNI 32 would retain a qualified archaeologist to serve as a cultural monitor during construction of the facility in order to avoid potential impacts on cultural sites. The BLM would decide when cultural monitors are necessary.
10. One tribal monitor, funded by Ormat and contracted through the tribe, would be present during all initial ground-disturbing activity.
11. Limit vehicle and equipment travel to established roads and roads that are part of the Proposed Action.
12. Any accidental discovery of cultural resources, items of cultural patrimony, sacred objects, or funerary items would require that all activity in the vicinity of the find ceases, and the BLM Field Manager, CCD, Stillwater Field Office, 5665 Morgan Mill Road, Carson City, Nevada 89701, be notified immediately by phone (775-885-6000) with written confirmation to follow. The location of the find would not be publicly disclosed, and any human remains must be secured and preserved in the place until a Notice to Proceed is issued by the BLM Authorized Officer.
13. Following project construction, areas of disturbed land no longer required for operations would be reclaimed and reseeded with a BLM-approved seed mix. This would promote the reestablishment of native plant and wildlife habitat. All seed must be certified weed seed free and tested in a certified laboratory per BLM protocols. Noxious, invasive, and nonnative seeds listed in the Nevada Designated Noxious Weed List (Nevada Administrative Code 555.010) or prohibited by the Federal Seed Act (7 CFR Part 201) would be excluded. Seed mixtures would be subject to the approval of the BLM.
14. Geothermal fluids would not be discharged to the ground under normal operating conditions. Accidental discharges of geothermal

fluids are unlikely because of frequent inspections, ultrasonic testing of the pipeline, flow and pressure monitoring, and well pump and pipeline valve shutdown features.

15. The power plants, pipelines, wellheads, pump motors and motor control buildings would each be painted to blend with the area and minimize visibility.
16. ORNI 32 would obtain and comply with a UIC permit issued by the NDEP.
17. Speed limits of 25 mph would be maintained for project-related travel through the Project Area (BLM 2007a).
18. Noise would be minimized through equipment design and operation. Vinyl fencing slats would be used, and the plant design would be reviewed for opportunities to reduce noise.
19. An Injury Contingency Plan, Fire Contingency Plan, Spill or Discharge Contingency Plan, and Hydrogen Sulfide Contingency Plan would be submitted to the BLM and complied with.
20. A reclamation plan describing interim and final reclamation procedures for this Project would be developed prior to construction and implemented after BLM approval.

In addition to the environmental protection measures listed above, ORNI 32 proposes the following additional mitigation measures to further facilitate avoidance or minimization of potential adverse environmental impacts:

1. All areas proposed to be disturbed during construction would first be surveyed for BLM sensitive wildlife and plant species. Surveys would be coordinated with the BLM wildlife biologist and would be conducted by a qualified biologist, in accordance with the survey protocols of the BLM, the NDOW, or both. If sensitive species were observed during preconstruction surveys, measures to avoid or minimize impacts would be developed in coordination with the BLM, the NDOW, or both.
2. All pits or containers containing liquids potentially harmful to wildlife, avian, and bat species would be fenced, netted, or otherwise covered when not in active use. Fencing would be 8 feet high and of a material conforming to NDOW Geothermal Sump Guidelines. It would include a 0.5-inch or smaller mesh screen at the lower 2 feet, buried at least 6 inches to prevent small mammal and amphibian entry. Netting or other covering would be installed if toxic substances were stored in a pit or if fluids would remain after drilling equipment is removed from the well pad. Netting would consist of 1.5-inch mesh, secured to the ground, 4 to 5 feet above

the liquid solution surface. Netting would be monitored and maintained in functioning condition.

3. Pits, cellars, open-top tanks, and trenches that are not otherwise fenced, screened, covered, or netted would be constructed to exclude livestock, wildlife, and humans. At a minimum, escape ramps, ladders, or other methods of escape would be maintained at appropriate intervals, where entrapment hazards exist.
4. All open pipes, uncapped hollow pipes, or tube-like structures under 12 inches in diameter would be replaced with wildlife-safe structures or would be capped, closed, removed, or screened to reduce the likelihood of adverse impacts on wildlife, in accordance with BLM Instruction Memorandum No. 2016-023. All existing and proposed drill holes and well openings would be capped where wildlife escape ramps are not feasible or do not conform to BLM requirements.
5. An Aquatic Resources Monitoring and Mitigation Plan would be developed before the project begins. The purpose of the monitoring and mitigation plan is to ensure that significant adverse effects on aquatic resources (water resources, riparian and wetland vegetation, and aquatic special status species) do not occur. A summary of potential plan components are outlined below; full plan development would occur with close coordination between the BLM and ORNI 32, as exploration continues and before the project begins.
6. A buffer of 50 feet would be established around the sand cholla individual observed within the northern gen-tie route before construction of the gen-tie line. If avoidance is not possible during construction activities, potential mitigation could include transplanting the individual into suitable habitat, followed by monitoring of transplantation success. Any subsequent gen-tie line maintenance would also avoid the sand cholla individual by remaining outside of a 50-foot buffer around the individual. These measures would apply to any other BLM sensitive plant species observed in the work areas.
7. Construction activities on playa habitats would be limited to dry periods when seasonal surface inundation is not present.
8. Temporarily stockpiled topsoils would be seeded with a BLM-approved seed mix. This would be done to minimize erosion and soil loss, increase topsoil organic content, and ultimately increase restoration success at reclamation.
9. The riparian areas stipulation, summarized below (see **Appendix A** for full stipulations), would be in effect on all land ownerships, including BLM and US Navy lands.

10. All project activities would be in conformance with greater sage-grouse RDFs within mapped greater sage-grouse OHMA as outlined in **Appendix B**. RDFs would not apply outside of greater sage-grouse OHMA.
11. To reduce the potential of injury or mortality to migratory birds and bats from the Proposed Action, and to ensure adequate monitoring is in place to determine if mortalities are occurring, a Bird and Bat Conservation Strategy (BBCS; **Appendix C**) was developed with the goal of reducing the potential impacts on avian species and bats resulting from construction and operation of the project.

Fire Contingency Plan

All construction and operating equipment would be equipped with applicable exhaust spark arresters. Fire extinguishers would be available on the site. Water that is used for construction and dust control would be available for firefighting. Personnel would be allowed to smoke only in designated areas, and they would be required to follow applicable BLM regulations regarding smoking (restrictions on smoking would only apply during implementation of fire restriction by the BLM on public lands). A water tank would be onsite and the water would be used to fight fires, if necessary. The facilities would also have a fire monitor onsite and would have water storage associated with the back-up diesel generators which could also be used to fight fires. The following fire contingency plan is provided below:

1. Any small fires which occur at the power plant facilities or around the well pad during drilling and/or testing operations should be able to be controlled by rig personnel utilizing on-site firefighting equipment.
2. Vegetation is extremely sparse in the Project Area, so wildland fires are unlikely. However, the BLM CCD ([775]-885-6000) would be notified of any wildland fire, even if the available personnel can handle the situation or the fire poses no threat to the surrounding area. Additionally, the Sierra Front Interagency Dispatch Center would be notified at (775) 883-5995.
3. A roster of emergency phone numbers would be available onsite so that the appropriate firefighting agency can be contacted in case of a fire.
4. Construction vehicles shall carry at a minimum a shovel and five gallons of water (preferably in a backpack pump), in addition to a conventional fire extinguisher.
5. Adequate firefighting equipment (a shovel, a pulaski, standard fire extinguishers, and an ample water supply) shall be kept readily available at each active drill site.

6. Vehicle catalytic converters (on vehicles that would enter and leave the drill site on a regular basis) shall be inspected often and cleaned of all flammable debris.
7. All cutting/welding torch use, electric-arc welding, and grinding operations shall be conducted in an area free, or mostly free, from vegetation. An ample water supply and shovel shall be on hand to extinguish any fires created from sparks. At least one person in addition to the cutter/welder/grinder shall be at the work site to promptly detect fires created by sparks.
8. Personnel would be responsible for being aware of and complying with the requirements of any fire restrictions or closures issued by the BLM CCD, as publicized in the local media or posted at various sites throughout the field office district.

Aquatic Resources Monitoring and Mitigation Plan Summary

An Aquatic Resources Monitoring and Mitigation Plan would be developed to ensure that significant adverse effects on aquatic resources do not occur from the project. Mitigation recommended in the plan would be consistent with BLM policy (BLM Manual MS-1794, Mitigation). Aquatic resources addressed in the plan would include water resources, wetlands and riparian vegetation, and aquatic-dependent special status species. These components are summarized in the sections below.

Geothermal resources, groundwater resources, surface waters, and associated riparian and wetland areas are described in greater detail in **Section 3.3**, Water Resources, and **Section 3.9**, Wetlands and Riparian Areas. Special status species dependent on these areas are described in greater detail in **Section 3.8**, BLM Sensitive Species.

Water Resources

There is a series of small springs, seeps, and marshy areas that are mostly in a north-south alignment, to the east of the proposed development area. The springs are cooler to the south and hotter to the north, where the Dixie Hot Springs are located (SW¹/₄, SE¹/₄ of Section 5, T22N, R35E).

The Geothermal Programmatic EIS (BLM 2008c) stipulates that any leases containing thermal features (e.g., springs or surface expressions) require monitoring of the thermal features during any exploration, development, and production of the lease to ensure that there are no impacts on water quality or quantity. Conformance with this requirement would be ensured by following water resources monitoring outlined in this section.

The Dixie Meadows Water Resources Monitoring Plan (Ormat 2011) prepared for exploration activities is a dynamic document that is updated as new information and understanding of the geothermal resources in the geothermal unit area improve. Ormat would continue to develop and revise the water

resources monitoring plan, in coordination with the BLM, as exploration continues and during development.

The revised plan would provide a monitoring framework to detect potential adverse impacts on the quality, quantity, and temperature of nearby surface water springs and groundwater from project construction and operation before significant impacts occur. The plan would include recommendations for mitigation measures to reduce, reverse, and prevent further impacts on the resources.

At a minimum, recommended monitoring would consist of collecting the following representative data from selected springs and groundwater monitoring wells: temperature, flow rate, groundwater-level measurements, and parameters on the NDEP UIC Sample List 2¹ before and during project operation.

Final monitoring well and spring locations would be made in consultation with the BLM. ORNI 32 would also work to gain access to US Navy lands for hydrological monitoring.

Unless otherwise modified by the BLM Authorized Officer, the monitoring schedule would include:

- Quarterly, beginning at least 1 year before the commencement of geothermal fluid production and injection operations;
- Quarterly, for 2 years after commencement of geothermal fluid production and injection operations, and semi-annually thereafter until all geothermal wells within the geothermal unit area have been abandoned.

Collected data would be reported to the BLM in written form by the unit operator annually within 30 days of the end of each calendar year, together with an interpretation of the monitoring data collected during the preceding calendar year.

If monitoring were inadequate to determine potential effects, the BLM Authorized Officer may require the unit operator to conduct additional monitoring, such as the following:

- Collection of monitoring data at increased monitoring frequencies
- Collection of additional monitoring parameters from monitoring locations
- Collection of monitoring data from additional monitoring locations

¹ NDEP UIC Sample List 2 Internet website: http://ndep.nv.gov/bwpc/docs/uiform_nv_uic_samplelist2.pdf.

If facility operations appear to be having adverse impacts on the spring flow volumes, groundwater levels, water quality or temperature, or aquatic habitat conditions or functions, the BLM, in coordination with the operator, would recommend expanded monitoring, data collection, and analysis to identify the causes and locations of the adverse impacts. The BLM and the operator would then develop and implement reasonable mitigation measures to reduce or reverse the adverse impacts, and prevent the development of significant adverse impacts. Such measures may include implementing appropriate geothermal reservoir management techniques to minimize or reverse the adverse impacts. Such geothermal reservoir management techniques may include the following:

- Modifying the volume or pressure of geothermal fluids produced from one or more production wells within the geothermal unit area field and monitoring the reservoir, surface water, and groundwater response
- Modifying the volume or pressure of geothermal fluids injected into one or more injection wells within the geothermal unit area field and monitoring the reservoir, surface water, and groundwater response
- Relocating one or more production or injection wells within the geothermal unit area
- Changing the depth of geothermal fluid injection in one or more geothermal unit area injection wells
- Providing geothermal fluids to the affected springs of a quality and quantity sufficient to restore pre-production temperature, flow stage or equivalent, and basic water chemistry of the springs
- Temporarily suspending geothermal reservoir utilization or reinjection
- Other measures as directed by the BLM Authorized Officer, pursuant to the lease stipulations

As additional wells are drilled and new geologic and hydrologic information is collected, the hydrogeologic model for the geothermal system would be updated and revised as necessary. ORNI 32 would update the aquatic resources monitoring and mitigation plan as necessary, and in coordination with the BLM, to show new information and well locations.

Wetlands and Riparian Vegetation

Wetlands and riparian vegetation is present in and near seeps and springs in Dixie Meadows. To ensure that potential significant adverse effects on wetlands and riparian vegetation do not occur, the aquatic resources monitoring and mitigation plan would provide a monitoring framework to detect potential adverse effects on wetlands and riparian vegetation. It would include recommendations for mitigation measures to reduce, reverse, or prevent such

effects. As noted above, the plan would be closely coordinated by ORNI 32 and the BLM, and it would be implemented before the project begins.

The extent of wetlands, riparian vegetation, and playas in the Project Area would be mapped during plan development. This would be done to provide baseline conditions against which future monitoring results would be compared.

Monitoring components would be refined with the BLM during plan development. At a minimum, monitoring would include visual assessments of the extent, condition, and function of wetlands and riparian areas. If facility operations appear to be having adverse effects on the extent, condition, or function of wetlands and riparian areas, the BLM, in coordination with the operator, would recommend expanded monitoring, data collection, and analysis to identify the causes and locations of the impacts, and, if attributed to the proposed action, reasonable mitigation measures to reduce, reverse, or prevent the development of significant adverse effects. Such measures may include implementing appropriate geothermal reservoir management techniques to adjust or reverse the adverse effects, as described above.

The plan would also provide detailed measures to avoid or reduce construction-related impacts on wetlands and riparian areas. Measures may include siting project components outside wetlands and riparian areas, using existing roads or disturbed areas to construct project components in or near wetlands and riparian areas, restricting access seasonally during periods of saturated soils or during the growing season, minimizing vegetation removal, and reclaiming areas of temporarily disturbed vegetation.

Aquatic-Dependent Special Status Species

Aquatic habitat for several special status species, including Dixie Valley toad (*Anaxyrus boreas*), Dixie Valley pyrg (*Pyrgulopsis dixensis*), and northern leopard frog (*Rana pipiens*), is present in and near seeps and springs in Dixie Meadows. To ensure that potential significant adverse effects on these species and their habitats do not occur, the aquatic resources monitoring and mitigation plan would provide a monitoring framework to detect potential adverse effects. It would include recommendations for mitigation measures to reduce, reverse, or prevent such effects if observed. As noted above, the plan would be closely coordinated by ORNI 32 and the BLM, and it would be implemented before the project begins.

The plan would outline preconstruction surveys in suitable habitat of Dixie Meadows. Surveys would provide data on the presence or absence and range extent for these species. It also would provide baseline conditions against which future monitoring results would be compared. Monitoring components would be refined with the BLM during plan development. Hydrological and wetland and riparian vegetation monitoring data would be used to monitor aquatic habitat conditions.

Monitoring would include gathering surface water quality, flow, and temperature data at two seasonal ponds in T22N, R35E, Section 9. Surface water monitoring would be suspended when the ponds are dry, which typically occurs during the summer. The ponds are habitat for, and known to be occupied by, the Dixie Valley toad.

If adverse effects are anticipated or observed that are determined to be a result of the Proposed Action, including effects on spring flow volumes, water quality or temperature, or aquatic habitat conditions or functions, mitigation measures would be implemented, as described in the plan, to ensure no net loss to these species or their habitats. The plan would establish appropriate hydrologic triggers for increased monitoring, mitigation measures, adaptive management, and mitigation actions in close coordination between the operator and the BLM.

The plan would also provide detailed measures to avoid or reduce construction-related impacts. Measures may include such measures as implementing preconstruction surveys, installing exclusion fencing, biological monitoring during construction, siting project components outside of wetlands and riparian areas, using existing roads or disturbed areas to construct project components in or near wetlands and riparian areas, minimizing vegetation removal, and reclaiming areas of temporarily disturbed vegetation.

Geothermal Lease Stipulation Summary

As discussed in **Section 1.5.1**, the Programmatic Environmental Impact Statement for Geothermal Resources Leasing in the Western United States (BLM 2008c) and ROD and Resource Management Plan Amendments for Geothermal Resources Leasing in the Western United States (BLM 2008d) developed geothermal leasing stipulations that were applied to geothermal resource leases subsequently issued by the BLM.

Stipulations are included in the federal geothermal leases issued to or acquired by Ormat in the Dixie Valley Geothermal Unit Area. These stipulations are summarized below, and full copies are provided in **Appendix A. Table 6**, below, shows which stipulations apply in each lease in the geothermal unit area.

Table 6
Geothermal Lease Stipulation Summary

Lease Number	Endangered Species Act Consultation	Cultural Resource Protection	Riparian Areas (650-foot buffer)	Riparian Areas (500-foot buffer)	Native American Consultation
NVN-83934	X	X	X		X
NVN-83935	X	X	X		X
NVN-83936	X	X	X		X
NVN-83937	X	X	X		X
NVN-83939	X	X	X		X
NVN-83941	X	X	X		X
NVN-83942	X	X	X		X

Table 6
Geothermal Lease Stipulation Summary

Lease Number	Endangered Species Act Consultation	Cultural Resource Protection	Riparian Areas (650-foot buffer)	Riparian Areas (500-foot buffer)	Native American Consultation
NVN-86885	X	X	X		X
NVN-91823	X		X		X
NVN-92479	X			X	X
NVN-92717	X	X		X	X

Source: Full lease stipulations in **Appendix A**

Endangered Species Act Section 7 Consultation Stipulation

Leases with this stipulation may contain plants, animals, or their habitats determined to be threatened or endangered or to have special status. The BLM may recommend modifying exploration and development proposals. This would be done to further its conservation and management objective and to avoid a BLM-approved activity that would contribute to a need to list such species or their habitats.

Cultural Resource Protection Lease Stipulation

Leases with this stipulation may be found to contain historic properties or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, or other statutes and executive orders. The BLM would not approve any ground-disturbing activities that may affect any such properties or resources until it completes its obligations under applicable requirements of the NHPA and other authorities.

Native American Consultation Stipulation

All development activities proposed under the authority of leases with this stipulation are subject to the requirement for Native American consultation, before the BLM authorizes the activity.

Riparian Areas Stipulation

Most leases in the Project Area contain a stipulation to protect riparian areas. This states that no surface occupancy or disturbance would be allowed within either 500 or 650 feet (horizontal measurement), depending on the lease, from any surface water bodies, riparian areas, wetlands, playas, or 100-year floodplains (see full lease stipulations in **Appendix A**). This stipulation would protect the integrity of these resources, which would be delineated by the presence of riparian vegetation and not actual water. Exceptions may be considered on a case-by-case basis if the BLM determines at least one of the following conditions applies:

- Additional development is proposed in an area where current development has shown no adverse impacts

- Suitable off-site mitigation would be provided if habitat loss is expected
- The BLM determines development proposed under any plan of operations would ensure adequate protection of the resources

2.2 ALTERNATIVE I (SOUTHERN GEN-TIE ROUTE)

Under Alternative I, the applicant would construct and operate the proposed project as described in the Proposed Action. The only differences would be a different gen-tie route and associated facilities.

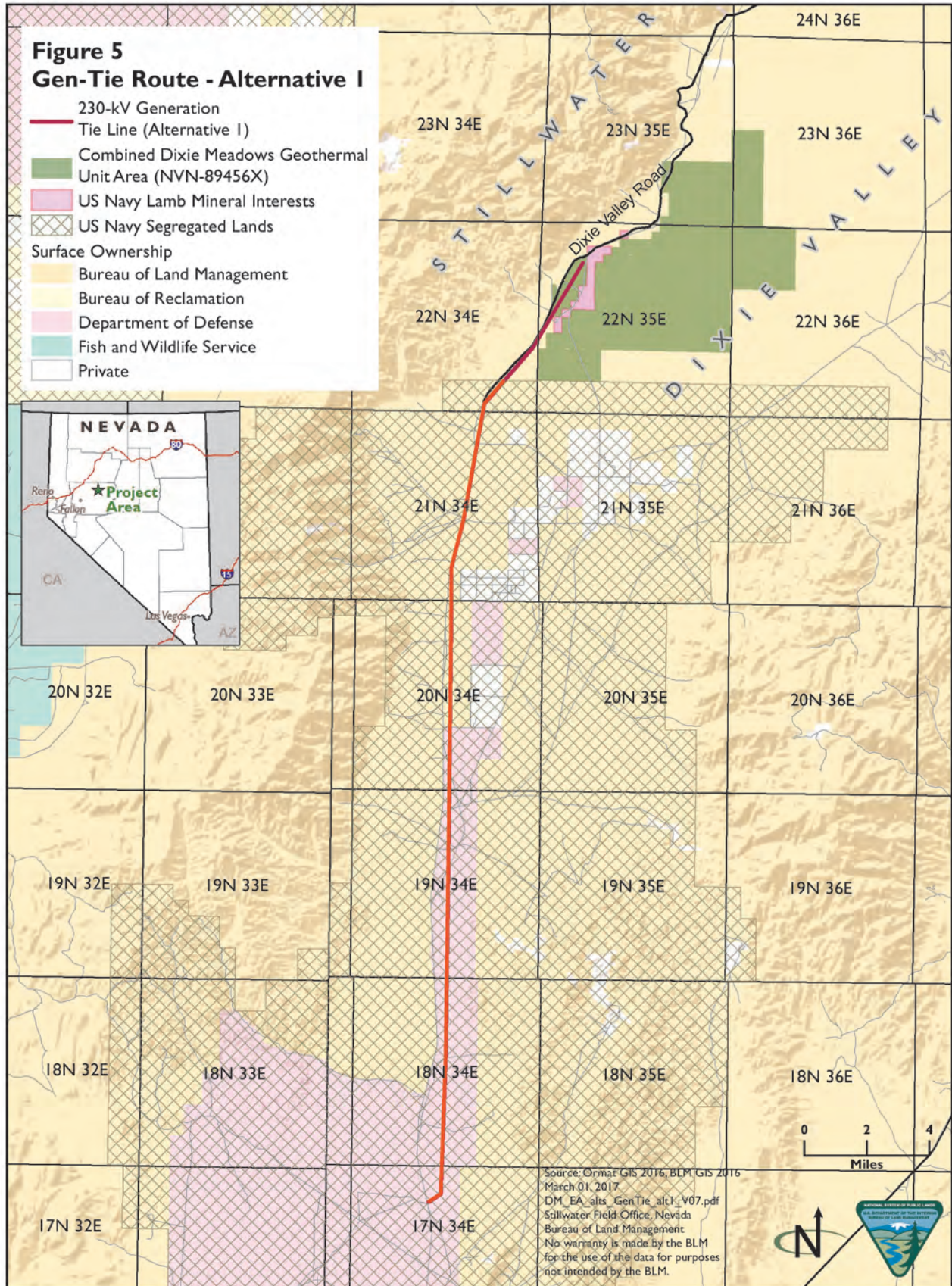
2.2.1 Route Description

Under Alternative I, the gen-tie would extend about 31.3 miles to the south from substations at the proposed Dixie Meadows Geothermal power plants to NV Energy's Fort Churchill to Gonder 230-kV transmission line (see **Figure 5**, Gen-Tie Route - Alternative I). Throughout its length, the gen-tie would run parallel to the existing Oxbow power line. This transmission line cannot be used by the Dixie Meadows project. This is because, per discussions with the line's operator, there may not be adequate capacity for the proposed Dixie Meadows project, so a separate transmission line is required. To maintain adequate separation from US Navy-operated low altitude aircraft, gen-tie towers would not exceed 100 feet in height.

Approximately 26.7 miles of this line would be located within an area that has been segregated from all forms of appropriation under the public land laws, including the mining laws, mineral leasing laws, and geothermal leasing laws, subject to valid existing rights. The BLM has segregated this area in response to an application received from the DON for a withdrawal expansion for military use of the Naval Air Station Fallon, Fallon Range Training Complex in Churchill County, Nevada. The segregation is in effect for a period of 2 years from September 2, 2016, unless the application/proposal is cancelled or approved prior to that date.

Two gen-tie alignments adjacent to the Oxbow line are possible. Both alignment options are located on BLM-administered land and US Navy lands. No private property would be affected. For either alignment, a switching station would be required at the terminus site to connect the gen-tie to the NV Energy line. Depending on the gen-tie alignment, this substation would be located on US Navy lands on either the west side or east side of the Dixie Valley highway. The switching station and access roads would be 8 to 10 acres in size.

The preferred gen-tie alignment option would run adjacent to the east side of the Oxbow line from the proposed Dixie Valley power plants for about 11 miles, and would then cross under the Oxbow line. For the remainder of its length, the alignment would follow the west side of the Oxbow line. The advantage of this route is easier access to its potential terminus switching



station site, which would be on the west side of the Dixie Valley Road, north of the NV Energy line. The switching station site would have easy access along an existing gravel road.

The other alignment would run along the east side of the Oxbow Line for its entirety. No crossings of the Oxbow Line would be necessary except at the proposed Dixie Meadows power plant[s]. The terminus switching station site of this east-side route would be located east of the Oxbow line, north of the NV Energy line. The site would be in a less-accessible area east of the Dixie Valley Road and the Dixie Valley Wash. This site has steeper slopes and a dry wash that bisects the site. A potentially expensive road with large culverts and/or a bridge crossing the Dixie Valley wash would be required.

Construction of the switching station site would begin by clearing existing vegetation and grading a level pad for installation of the substation. Once the pad is prepared, the site would be secured with chain-link fencing. Holes for the structure footings and underground utilities would then be excavated. The footings and underground utilities would be installed, including electrical conduits and additions to the ground grid, and the excavations would be backfilled. Aboveground structures and equipment would then be installed.

Once the equipment is installed, pit run gravel, 2 inches wide or less, would be spread over the site to a depth of approximately 4 inches. Gravel would be obtained through a mineral material sales contract with the BLM.

2.2.2 Components

The line voltage would be 230-kV, and a single transformer at the power plant would be used to step voltage up to 230-kV.

2.2.3 ROW Width Requirements

ROW width requirements would be the same as described under the Proposed Action.

2.2.4 Construction, Operation, and Decommissioning

Construction, operation, and decommissioning methods would be the same as described under the Proposed Action. Because the gen-tie would be shorter than under the Proposed Action, there would be less temporary and permanent disturbance associated with this alternative.

Table 7, Area of Disturbance (Alternative 1), summarizes the proposed new facilities with estimated area of permanent and temporary disturbance for each facility.

2.2.5 Restoration and Reclamation

Restoration and reclamation would be the same as described under the Proposed Action.

Table 7
Area of Disturbance (Alternative 1)

Disturbance Type	Amount of Disturbance (Approximate Acres)	Amount of Disturbance to Be Reclaimed (Approximate Acres)	Amount of Disturbance that Would Not Be Reclaimed (Approximate Acres)
Production and injection wells	90	45	45
Exploration core holes and water wells	10	5	5
Power plants and substation	64	32	32
Gen-Tie and switching station	1,150	1,140	10
Access roads/pipelines	40	20	20
Total	1,354	1,242	112

Source: Ormat GIS 2016

2.2.6 Environmental Protection Measures

Environmental protection measures would be the same as those described in **Section 2.1.6** for the Proposed Action.

2.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

The location of the power plants and facilities are limited by the bounds of the geothermal resources at the site. No other reasonable power plant technology was identified; a flash steam power plant is not suitable for this Project Area, because the temperature of the geothermal resource is too low. Well locations are preliminary and were determined based on commercial potential, and the exact location of each power plant would be dependent upon site-specific engineering factors.

The existing Terra-Gen 230-kV transmission line cannot be used because there may not be adequate capacity to accommodate the proposed Dixie Meadows project and the line's private owner has informed ORNI 32 that they are reserving any available capacity for their own future use. Thus, the gen-tie route selection was predicated upon the gen-tie line interconnecting to one of the two nearest available transmission lines with available capacity.

2.4 NO ACTION ALTERNATIVE

Under the No Action Alternative, the BLM would not approve the Proposed Action, the facilities would not be constructed, and ORNI 32 would likely suspend exploration activities authorized under the two previous Decision Records for the foreseeable future. If exploration activities authorized under the two previous Decision Records are permanently suspended, ORNI 32 would remove and reclaim existing facilities.

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CHAPTER 3

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 SCOPING AND ISSUE IDENTIFICATION

This section 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 or effects of the actions.

The BLM CCD, Stillwater Field Office held an interdisciplinary team meeting on June 22, 2015. The following issues were identified as needing to be addressed in the environmental assessment: migratory birds, wildlife and key habitat, BLM sensitive species, wetlands and riparian areas, invasive/nonnative species, visual resources, cultural resources, Native American religious concerns, travel management, land use authorizations, hazardous or solid waste, and socioeconomics. Subsequent coordination with the interdisciplinary team identified air quality, water resources, soil resources, public health and safety, and wilderness study areas as needing to be addressed in detail. Public health and safety was combined with hazardous or solid waste, because similar issues were addressed in both.

The following issues were identified as not being present or affected in the proposed Project Area: areas of critical environmental concern; environmental justice; farm lands; forests and rangelands; threatened and endangered species; wild and scenic rivers; paleontological resources; lands with wilderness characteristics; recreation; and wild horses and burros. The supporting rationale for these determinations is provided in the table below.

3.1.1 Supplemental Authorities

Appendix I of the BLM's NEPA Handbook, H-1790-1 (BLM 2008a) identifies supplemental authorities that are subject to requirements specified by statute or executive order and must be considered in all BLM environmental analysis

documents (**Table 8**, below). Supplemental authorities that could be affected by the Proposed Action and alternatives are further described in this EA.

Table 8
Supplemental Authorities and Rationale for Detailed Analysis for the Proposed Action

Elements ^a	Not Present ^b	Present/ Not Affected ^b	Present/ May Be Affected ^c	Rationale
Air Quality			X	Carried forward in Section 3.2 .
Areas of Critical Environmental Concern	X			Not present.
Cultural Resources			X	Carried forward in Section 3.12 .
Environmental Justice	X			No minority or low-income populations would be disproportionately affected by the Proposed Action or Alternatives.
Farmlands (prime or unique)		X		The Proposed Action gen-tie traverses 6.6 miles of farmland of statewide importance and 10.7 miles of prime farmland, if irrigated and reclaimed of excess salts and sodium (Ormat GIS 2016); however, these areas are not currently used for agriculture. Under the Proposed Action, there would be no impacts on farmlands. The Proposed Action would not convert farmland of statewide importance or prime farmland, if irrigated and drained of excess salts and sodium, that is being used for agriculture; thus, a Farmland Conversion Impact Rating is not required, and no further consultation or coordination with NRCS is required. ¹
Floodplains	X			Not present. The FEMA 100-year floodplain is located over 1 mile east of the nearest proposed well (FEMA 2008).
Invasive, Nonnative, and Noxious Species			X	Carried forward in Section 3.10 .
Migratory Birds			X	Carried forward in Section 3.5 .
Native American Religious Concerns			X	Carried forward in Section 3.13 .

¹ Francine Lheritier, NRCS, personal communication with Drew Vankat, EMPSi, on March 24, 2016, regarding farmland conversion impact ratings.

Table 8
Supplemental Authorities and Rationale for Detailed Analysis for the Proposed Action

Elements ^a	Not Present ^b	Present/ Not Affected ^b	Present/ May Be Affected ^c	Rationale
Threatened or Endangered Species	X			After consulting with the BLM wildlife biologist, no threatened, endangered, candidate, or proposed species are known to exist in the Project Area. The USFWS determined that the Lahontan cutthroat trout (<i>Oncorhynchus clarkia henshawi</i> , Threatened) should be considered in an effects analysis for the Proposed Action (USFWS 2016). However, no suitable habitat for this species occurs in the Project Area or within the Dixie or Jersey Valleys that comprise the watersheds surrounding the Project Area. The nearest location of this species is located in Willow Creek and Big Den Creek, approximately 17 miles east of the southern gen-tie line and in Edwards Creek, approximately 30 miles south of the proposed plants. There is no designated or proposed critical habitat in the Project Area.
Hazardous or Solid Wastes			X	Carried forward in Section 3.17 .
Water Quality (Surface/Ground)			X	Carried forward in Section 3.3 .
Wetlands/Riparian Zones			X	Carried forward in Section 3.9 .
Wild and Scenic Rivers	X			Not present.
Wilderness/Wilderness Study Areas			X	Carried forward in Section 3.16 .

^a See BLM Handbook H-1790-1 (BLM 2008a), Appendix I, Supplemental Authorities to be Considered.

^b Supplemental authorities determined to be *not present* or *present/not affected* need not be carried forward or discussed further in the document.

^c Supplemental authorities determined to be *present/may be affected* must be carried forward in the document.

3.1.2 Resources Other Than Supplemental Authorities

Resources or uses that are not supplemental authorities as defined by the BLM's Handbook H-1790-1 (BLM 2008a) are present in the Project Area. BLM specialists have evaluated the potential impact of the Proposed Action on these resources and documented their findings in **Table 9**, below. Resources or uses that may be affected by the Proposed Action are further described in this EA.

Table 9
Resources Other Than Supplemental Authorities

Resource or Issue	Not Present^a	Present/ Not Affected^a	Present/May Be Affected^b	Rationale
Visual Resources			X	Carried forward in Section 3.11.
Minerals		X		Geothermal resources would not be consumed during operation due to use of a closed loop system. A sales contract with the BLM would be entered into for use of mineral materials consistent with BLM policies and regulations; as such impacts on minerals would be negligible.
Wildlife/Key Habitat			X	Carried forward in Section 3.7.
BLM Sensitive Species			X	Carried forward in Section 3.8.
Livestock Grazing		X		Impacts would be negligible because development would occur on a very small percentage of each allotment overlapping the project site and because there would be no reduction in animal unit months ² .
Socioeconomics			X	Carried forward in Section 3.18.
Fire Management		X		A Fire Contingency Plan is included under all action alternatives; therefore, no impacts on fire management are expected.
Soil Resources			X	Carried forward in Section 3.4.
Public Health and Safety				Carried forward in Section 3.17.
Paleontological Resources	X			Paleontological resources are not present in the Project Area.
Lands with Wilderness Characteristics	X			Lands with wilderness characteristics are not present in the Project Area.
Recreation		X		Numerous access roads in the vicinity allow for dispersed recreation to continue. Project construction is temporary in

² An animal unit month is the amount of forage required by one animal unit for one month. An animal unit is generally one mature cow and a calf, or their equivalent.

Table 9
Resources Other Than Supplemental Authorities

Resource or Issue	Not Present^a	Present/Not Affected^a	Present/May Be Affected^b	Rationale
				nature; recreation access restrictions would only take place during construction and on active well pads.
Land Use Authorizations			X	Carried forward in Section 3.15.
Travel Management			X	Carried forward in Section 3.14.
Vegetation			X	Carried forward in Section 3.6.
Wild Horses and Burros		X		There are no herd areas or herd management areas that overlap or occur within the Project Area. Wild horses do move through Dixie Valley and utilize some springs in the valley for water. However, the proposed project would not be anticipated to impact horses utilizing the valley. There are no wild burros present.

Source: BLM 2008a

^a Resources or uses determined to be *not present* or *present/not affected* need not be carried forward or discussed further in the document.

^b Resources or uses determined to be *present/may be affected* must be carried forward in the document.

3.1.3 Resources or Uses Present and Brought Forward for Analysis

The following resources are present in the Project Area and may be affected by the Proposed Action, and are carried forward for analysis:

- Air quality
- Water resources
- Soil resources
- Migratory birds
- Vegetation
- Wildlife and key habitat
- BLM sensitive species
- Wetlands and riparian areas
- Invasive, nonnative, and noxious weeds

- Visual resources
- Cultural resources (present/not affected)
- Native American religious concerns
- Travel management
- Land use authorizations
- Wilderness study areas
- Public health and safety and hazardous materials
- Socioeconomics

3.2 AIR QUALITY

3.2.1 Affected Environment

The United States Environmental Protection Agency (USEPA) and State of Nevada have designated the Nevada Department of Conservation and Natural Resources, NDEP Bureau of Air Pollution Control, and Bureau of Air Quality Planning as the authorities that regulate air pollution and quality in the state, except for Clark and Washoe Counties.

The Combined Dixie Meadows Geothermal Unit Area (NVN-89456X) is exclusively situated in Churchill County. In the Proposed Action, the gen-tie is located in both Churchill and Pershing Counties. In Alternative I, the gen-tie is only located in Churchill County. Both Churchill and Pershing Counties are classified as attainment areas, indicating that they have air quality that meets or is superior to the National Ambient Air Quality Standards (NAAQS). The NAAQS identifies primary, or criteria, pollutants that cannot exceed emission levels based on public health concerns. These pollutants include carbon monoxide, lead, nitrogen dioxide, ozone, particle pollution, and sulfur dioxide.

Under Section 162(a) of the Clean Air Act, certain federal lands defined as Federal Class I Areas, such as national parks, national wilderness areas, and national monuments, are granted special and the most restrictive air quality protections. There are no Federal Class I Areas located in the project site, with the nearest being the Desolation Wilderness Area, which is approximately 121 miles away from the project site. Due to the long distance between these two sites, laws and regulations associated with Federal Class I Areas are not applicable to the Dixie Meadows Geothermal Utilization Project.

3.2.2 Environmental Consequences

Proposed Action (Northern Gen-tie Route)

Emissions produced during grading and construction, including from vehicle use, are short term and would cease upon completion of construction. Similarly, emissions produced during drill rig operation would be short term and would cease upon drilling completion.

Dust would be minimized by application of water to disturbed areas. A Surface Area Disturbance permit with the Bureau of Air Pollution Control would be obtained prior to start of construction. Construction would comply with all the requirements of that permit. Once the plants are operational, the Surface Area Disturbance regulation would continue as a part of the project's Air Quality Operating permit.

The power plants would not release non-condensable gas during normal operations. However, a small amount of the binary motive fluid (pentane or butane isomers) would be released to the atmosphere from rotating seals and flanges. During normal operations, a small quantity of air enters the motive fluid loop in the air-cooled condenser. When purged, a small amount of the motive fluid could be discharged to the atmosphere via the purge stack.

Some liquid motive fluid would be stored on-site in a tank. When the binary power plant unit is opened, motive fluid liquid and vapor would first be removed from the system and returned to the storage tank. NDEP's Bureau of Air Pollution Control would issue a permit to ensure ambient concentrations of ozone from these sources would not exceed applicable Ambient Air Quality Standards.

Alternative 1 (Southern Gen-tie Route)

Impacts would be similar to those described under the Proposed Action; however, since the southern gen-tie route is approximately 17 miles shorter than the northern gen-tie route, impacts would be slightly reduced under this alternative. This is because construction would occur over a shorter period.

No Action Alternative

Under the No Action Alternative, the BLM would not approve the Proposed Action, the facilities would not be constructed, and ORNI 32 would likely suspend exploration activities authorized under the two previous Decision Records for the foreseeable future. As such, there would be no change in air quality conditions at the site.

3.3 WATER RESOURCES

3.3.1 Affected Environment

Surface Water

Dixie Valley is typical of many basin and range valleys in Nevada and has been filled with thousands of feet of unconsolidated deposits of alluvial and lakebed sediments. Surface water flows onto the valley floor only in response to significant rainfall and snowmelt events in the adjacent mountains. It travels down ephemeral drainages to the valley bottom where it collects on the playas, and then evaporates. The largest playa is the Humboldt Salt Marsh, located in the center of the Dixie Valley, which is traversed by a portion of the northern gen-tie route.

Two smaller adjacent playas are present on the property east of the hot springs in T22N, R35E, Section 9 and at a slightly higher elevation than the Humboldt Salt Marsh. The western playa appears to be the end-point for much of the water that originates from the northern hot springs (described below) and from stormwater runoff and often contains standing water. The smaller eastern playa is more often dry. A third playa, located in T22N, R35E, Section 20, receives runoff from upgradient areas, but is usually dry.

Hot and Cold Springs

A series of hot, warm, and cold springs and seeps is present in the lease area, most of which are located on the US Navy lands, primarily in T22N, R35E, Sections 4, 5, 8, and 17. There are additional springs on BLM-administered lands in Sections 4 and 19.

Surface water discharge occurs from approximately 10 to 15 spring orifices in this area, although more may be concealed by vegetation (Interflow Hydrology and Mahannah and Associates 2012a). For some of the springs, such as the main Dixie Hot Spring, and several springs to the northeast, discharge becomes channelized and can be measured. In October 2009, the main channel of Dixie Hot Spring was measured at 190 gpm (0.43 cubic feet per second [cfs]). Subsequent measurements have observed flow ranging from 107 to 237 gpm between 2009 and 2012. Discharge at other springs in this complex have been measured or estimated at between 3 and 100 gpm (Interflow Hydrology and Mahannah and Associates 2012a). Spring channels generally exist for only a short distance before they cease and transition to sheet flow.

The hottest springs are located in the central and northern portion of this series of springs, while cooler-temperature springs exist to the south. Temperatures of surface water discharge have been reported to range from 137.3 °F (58.5 °C) at the Dixie Hot Spring in the north-central portion of the complex, to 84 °F (29 °F) at discharge points in the south (Interflow Hydrology and Mahannah and Associates 2012a).

The BLM and USGS conducted a site visit in October 2016 and recorded higher spring temperatures at two main springs in the Dixie Hot Springs area. A spring in T22N, R35E, Section 8 (NW quarter of the NE quarter) measured 152.6 °F (67 °C); a spring in T22N, R35E, Section 5 (SW quarter of the SE quarter) measured 163.4 °F (73 °C). An additional spring in T22N, R35E, Section 4 (NE quarter of the SW quarter) measured 50 °F (10 °C).

The spring water flows east toward the Humboldt Salt Marsh and supports wetlands and other vegetation both near the discharge and in down-gradient areas (see **Section 3.9**, Wetlands and Riparian Areas), until evapotranspiration consumes the flows.

See **Figure 6**, Surface Water, for springs and associated surface waters and wetland areas, the applicable riparian area lease stipulation buffer extending around these areas, and proposed well locations in the lease areas. This figure also depicts ephemeral drainages.

In 2007, NAS Fallon conducted a wetland delineation on US Navy land (see **Section 3.9**, Wetlands and Riparian Areas and **Figure 6**). A delineation of springs, surface waters, and wetlands has not been conducted on BLM-administered lands; therefore, these features, as shown on the figure, are from the USFWS National Wetland Inventory (NWI GIS 2016) and the USGS National Hydrography Dataset (NHD GIS 2016). A delineation of these features on BLM-administered lands would be completed before the project begins. This would be done to ensure project compliance with applicable riparian lease stipulations (see **Section 2.1.6**, Environmental Protection Measures).

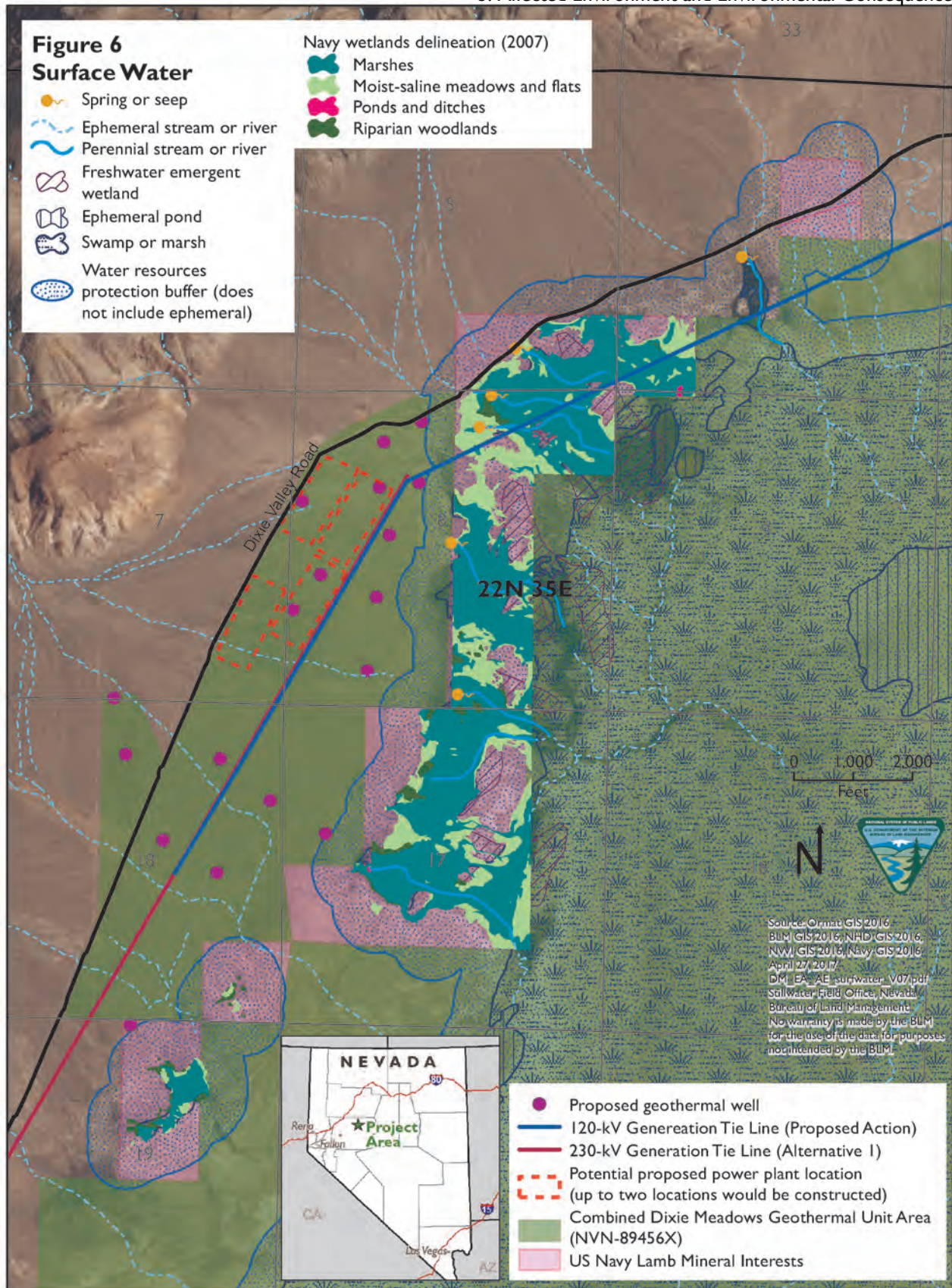
Spring Monitoring

Monitoring was conducted by the US Geological Service (USGS) in Dixie Valley as part of the interagency Groundwater Export Study conducted in Dixie Valley by the US Bureau of Reclamation, State Engineer, and Churchill County, as well as the USGS. This study (Huntington et al. 2014) included inventorying, sampling, and monitoring streams, springs, and wells, and collecting precipitation and evapotranspiration data throughout Dixie Valley between 2009 and 2011.

The USGS National Water Information System³ shows two water quality observations at two springs near the lease area in 2009. Spring USGS-301 (Section 17) was monitored on October 27, 2009. Surface water temperature was 29 °C (84 °F). Spring USGS-101 (Section 4) was monitored on October 30, 2009. Surface water temperature was 26 °C (79 °F). Additional water quality parameters are included below:

- Total dissolved solids (TDS) = 565 to 829 milligrams per liter (mg/L)
- Specific conductance = 1,150 to 1,390 microSiemens per centimeter
- pH = 7.8 to 8.5 standard units
- Hardness = 34 to 60 mg/L
- Alkalinity = 84 to 86 mg/L
- Calcium = 11.3 to 22.8 mg/L
- Magnesium = 0.59 to 1.34 mg/L
- Sodium = 170 to 249 mg/L
- Potassium = 1.15 to 2.97 mg/L

³ Internet website: <https://waterdata.usgs.gov/nwis>



- Chloride = 146 to 289 mg/L
- Sulfate = 107 to 129 mg/L
- Silica = 48.2 to 60.2 mg/L

Additional water quality data for the Dixie Hot Springs in Section 5 are available from the Great Basin Center for Geothermal Energy (2016). Two water samples (DV97-69 and DV98-120) collected in 1997 and 1998, respectively, had the following selected characteristics:

- TDS = 665 to 723 mg/L
- Specific conductance = 1,006 to 1,011 microSiemens per centimeter
- pH = 7.2 to 8.1 standard units
- Temperature = 82 to 84 °C (180 to 183 °F)
- Bicarbonate = 71 to 94 mg/L
- Calcium = 10.7 to 11.0 mg/L
- Magnesium = 0.12 to 0.22 mg/L
- Sodium = 194 to 211 mg/L
- Potassium = 4.9 mg/L
- Chloride = 161 to 162 mg/L
- Sulfate = 121 to 139 mg/L
- Silica = 105 to 107 mg/L

On September 27, 2016, ORNI 32 measured springs and seeps for flow, electrical conductivity (EC), temperature, and pH as part of the Dixie Meadows Water Resources Monitoring Plan (Ormat 2011) outlined for geothermal exploration; no previous data were collected prior to 2016. The sites visited were Dixie Corral Spring (USGS-101; T22N, R35E, section 4), the main Dixie Meadows Hot Spring (NDOWSS-1; T22N, R35E, section 5), and a warm spring (NDOWSS-2; T22N, R35E, section 17). **Table 10**, Seep and Spring Field Data, September 27, 2016, outlines collected data.

Groundwater

The Project Area is located in the Dixie Valley Hydrographic Area (Basin 128 of 256 in the State of Nevada). This hydrographic area is part of the Central Hydrographic Region (Number 10 of 14 in the state of Nevada), which is by far the largest hydrographic region in Nevada at nearly 30 million acres. The Dixie Valley Hydrographic Area is 833,920 acres, or less than 3 percent of the Central Hydrographic Region. The Dixie Valley Hydrographic Area is a Nevada state engineer-designated area or groundwater basin (NDWR 2015). The state engineer designates groundwater basins when permitted groundwater rights

Table 10
Seep and Spring Field Data, September 27, 2016

Site	Location	Flow Rate	Ec ¹	Degrees F	pH
Corral Spring (USGS-101)	Small pool just outside old fence	Seep into marshy wetland. Flow not measurable.	860	67.2	8.1
NDOWSS-1 (main hot spring)	Sampled just below pipe discharge	Estimated at 5 gpm at pipe. Multiple springs in area converge into one channel about 150 feet downstream. Flow there is estimated at 50 to 60 gpm.	1,320	>120 ²	Not reported
NDOWSS-2 (Section 17)	Deep pool behind salt cedar	None	1,240	77.1	8.3
NDOWSS-2 (Section 17)	Pool at edge of grass	None	1,280	86.7	8.2

Source: Ormat 2016

¹ Electrical conductivity ($\mu\text{mhos/cm}$)

² Temperature at this spring exceeded range of thermostat

approach or exceed the estimated average annual recharge and the water resources are being depleted or require additional administration. The Dixie Valley Hydrographic Area (Basin 128) was designated in 1978.

The NDWR lists the safe perennial yield of Basin 128 as 15,000 acre-feet/year. The hydrographic basin summary for Basin 128 lists a total use of 15,660 acre-feet/year, with the major uses of groundwater as irrigation (8,836 acre-feet/year), and industrial (6,220 acre-feet/year); the remaining uses are quasi-municipal, stockwater, and wildlife. Geothermal is considered industrial (12,704 acre-feet/year). NDWR considers geothermal use separate from that of underground use. This is because it has a finite life and is not directly connected to recharge received from the perennial yield.

Groundwater levels in Dixie Valley have remained generally constant since the 1950s. Observed changes are mostly in areas of historical, localized development as a result of withdrawals for irrigation, livestock, and domestic use, and from augmentation of geothermal reservoir pressure (Huntington et al. 2014).

Groundwater in the Dixie Valley occurs in two separate but related aquifer systems: a shallow, non-thermal, alluvial and igneous rock basin-fill aquifer system; and a deep, locally thermal, basement rock aquifer (Karst 1987). Groundwater in the alluvial deposits occurs under unconfined and confined

conditions. Hydraulic heads are typically beneath the elevation of the valley floor, but in some areas artesian flowing wells exist.

Aquifer testing in the Dixie Valley was conducted in 2012 to provide information on the hydraulic properties of the basin-fill aquifer (Interflow Hydrology and Mahannah and Associates 2012b). Wells tested were the main reservoir pressure support well at the Terra-Gen Dixie Valley plant, an agricultural irrigation well in northern Dixie Valley, and a flowing artesian well located near the abandoned Settlement area of central Dixie Valley. Transmissivity values of the basin-fill aquifer in the northern Dixie Valley ranged from 10,000 to 17,000 square feet per day, while in the central Dixie Valley, transmissivity was measured at 800 square feet per day. USGS estimates of transmissivity in the central and southern Dixie Valley ranged from 400 to 2,500 square feet per day (Huntington and Allander 2011 in Interflow Hydrology and Mahannah and Associates 2012b).

In the lease area near the valley floor, the playa deposits can be generally characterized as a complex, interfingering, and laterally discontinuous sequence of thin permeable layers of sand or gravel separated by thicker, low permeability confining layers of silt and clay. Groundwater in the Dixie Valley playa is chemically distinct from the groundwater in the alluvial deposits. Groundwater mixing between playa and alluvial fill groundwater systems is also likely physically impeded by transmissivity contrasts of about four orders of magnitude (Huntington et al. 2014). Therefore, groundwater flow and exchange between the basin-fill aquifer and playa are physically and chemically limited.

Concentrations of total dissolved solids in the playa groundwater range from about 184,000 to 310,000 mg/L (average 247,000 mg/L), which is 5–9 times greater than that of seawater (about 35,000 mg/L; Huntington et al. 2014). The high total dissolved solids of playa groundwater classify it as a brine (Drever 1982).

Groundwater in the basin-fill deposits moves from mountains toward the central part of the valley, eventually discharging at or near the playa edge. Discharge upgradient from and along the edges of the playa provides additional evidence of minimal mixing between fresh groundwater and the playa brine (Huntington et al. 2014).

Groundwater that discharges in springs appears to be controlled by one or more moderately to steeply dipping, north-south-trending faults that act as either barriers to lateral flow of cool groundwater originating in the Stillwater Mountains, or as a conduit that allows seepage of deep geothermal fluids to the surface. As a barrier, the faults would inhibit the migration of shallow groundwater moving from west to east, and force it to the surface in the area of the springs and seeps.

Huntington et al. (2014) reports that most basin-fill groundwater sampled generally contains between 10 and 12 percent geothermal water highlighting potential mixing between basin-fill and geothermal aquifer waters (geothermal aquifer waters are described in more detail below).

Four shallow wells in the central part of Dixie Valley near the lease area, ranging in depth from 10 to 50 feet and in diameter from 1 to 2 inches, were monitored for water levels by the USGS (Nevada State Wells 109435, 109491, 108770, and 108771; USGS 2016). Depth-to-water measurements in these wells ranged from approximately 0.5 to 14 feet below ground surface. Groundwater quality samples collected in November 2009 and May 2010 for two of the USGS wells (109491 and 109435; USGS 2016) showed the following characteristics:

- TDS = 173,000 to 184,000 mg/L
- Specific conductance = 133,000 to 162,000 microSiemens per centimeter
- pH = 9.2 to 9.4 standard units
- Temperature = 18 to 22 °C (64 to 72 °F)
- Hardness = 13 to 16 mg/L
- Alkalinity = 15,800 to 18,400 mg/L
- Calcium = 3.6 to 4.3 mg/L
- Magnesium = 1.2 to 1.4 mg/L
- Sodium = 67,500 to 92,800 mg/L
- Potassium = 174 to 325 mg/L
- Chloride = 107,000 to 146,000 mg/L
- Bromide = 104 to 122 mg/L
- Sulfate = 3,990 to 14,800 mg/L
- Nitrate plus nitrite = 16.0 to 17.3 mg/L
- Silica = 8.4 to 34.8 mg/L

ORNI 32 has also conducted groundwater sampling in the Project Area as identified in the Dixie Meadows Water Resources Monitoring Plan (Ormat 2011). Prior to drilling well 42(12)-9, ORNI 32 installed and sampled a monitoring well (MW-1) in the lease area northeast of well 42(12)-9, near the northeast corner of the western playa. The well was drilled to a depth of 472 feet. Mostly high-plasticity gray and blue clay was encountered to a depth of 327 feet, which was underlain by more clay with intervals of coarse sand to the total depth. Sampling for flow, temperature, and water quality was collected July 2011 (no water quality data were collected at this date), May 2012, and September 2016. In July 2011, an artesian flow rate of 3 to 4 gpm at a temperature of 84 °F

was reported. Ormat retested the well in May 2012 and observed an initial flow rate of 25 gpm, which decreased to 20 gpm after 20 minutes at a temperature of 72.9 °F (Ormat 2012). In September 2016, an initial flow rate of 25 gpm at 64.1 °F was observed, which decreased to 16 gpm after 30 to 40 minutes at a temperature of 73.2 °F (Ormat 2016). Sampling confirmed that the groundwater does not meet drinking water standards for several parameters. Sampling results for MW-1 for May 2012 and September 2016 are summarized in **Table II**, MW-1 Sampling Results; May 2012 and September 2016 (Ormat 2012; 2016).

Table II
MW-1 Sampling Results; May 2012 and September 2016

Monitoring Parameter	Result¹ (2012)	Result¹ (2016)
Free cyanide	ND	No data reported
Ammonia, as Nitrogen	0.66	No data reported
pH	8.08	8.24
Total Suspended Solids	ND	2
Bicarbonate (HCO ₃)	160	130
Carbonate (CO ₃)	ND	ND
Hydroxide (OH)	ND	ND
Total alkalinity (as CaCO ₃)	130	130
Orthophosphate	0.027	No data reported
Chloride	1,600	1,600
Fluoride	8.8	6.2
Sulfate	220	170
Nitrate nitrogen	ND	ND
Nitrite nitrogen	ND	No data reported
Total Dissolved Solids	2,900	3,100
Electrical conductivity	5,800	4,100
Aluminum	0.19	0.085
Barium	0.042	0.045
Beryllium	ND	ND
Boron	No data reported	1.7
Cadmium	ND	ND
Calcium	No data reported	27
Chromium	ND	ND
Copper	ND	ND
Iron	0.57	0.25
Lithium	No data reported	0.483
Magnesium	2.1	2.2
Manganese	0.098	0.082
Molybdenum	ND	ND
Nickel	ND	ND
Potassium	No data reported	7.1
Silica	No data reported	41
Silver	ND	ND
Sodium	1,200	1,300
Zinc	ND	ND

Table 11
MW-1 Sampling Results; May 2012 and September 2016

Monitoring Parameter	Result¹ (2012)	Result¹ (2016)
Mercury	0.0016	ND
Antimony	ND	ND
Arsenic	0.011	0.014
Lead	ND	ND
Selenium	ND	0.0056
Thallium	ND	ND

Sources: Ormat 2012; 2016

¹ All results are in mg/L, except for pH (standard units) and electrical conductivity ($\mu\text{mhos/cm}$)

ND = Not detected (less than reporting limit)

No data reported = sample parameter data not reported

Some constituents in groundwater samples collected from Dixie Valley exceeded established drinking-water quality criteria (Huntington et al. 2014). Primary drinking water standards were exceeded for arsenic (0.01 mg/L; 41 of 64 sites) and fluoride (4 mg/L; 17 of 45 sites), and secondary drinking water standards were exceeded for total dissolved solids (500 mg/L; 35 of 65 sites) and manganese (0.05 mg/L; 15 of 62 sites).

Geothermal Resources

Dixie Valley is the hottest (temperatures over 545 °F [285 °C] at 9,800 feet depth) and one of the largest geothermal systems in the Basin and Range province (Blackwell et al. 2009). A considerable volume of research into the Dixie Valley geothermal area has been conducted to characterize and describe the area's geothermal resources (Benoit 1999; Blackwell et al. 2002; Blackwell et al. 2003; McKenna and Blackwell 2004; Blackwell et al. 2007; Blackwell et al. 2009). The region has been used as a field laboratory to develop and test geothermal exploration methods (Iovenitti et al. 2013).

Geothermal groundwater resources with a wide range of temperatures are present beneath the basin-fill aquifer in Dixie Valley to estimated depths of 20,000 feet (Blackwell et al. 2003; Blackwell et al. 2009; McKenna and Blackwell 2004). The deep geothermal fluid is separated from the shallower groundwater by a confining sequence composed of thousands of feet of low-permeability, clay-altered volcanoclastic rocks and alluvium.

The Dixie Valley geothermal system occurs along the fault zone bounding the Dixie Valley and the Stillwater Range on the western edge of the valley (Blackwell et al. 2007). The Dixie Meadows is in the southern portion of this nearly 20-mile-long system. In this area, geothermal groundwater resources locally occur in fractured zones within the bedrock underlying the basin-fill deposits (Blackwell et al. 2003; Blackwell et al. 2009; McKenna and Blackwell 2004).

Blackwell et al. (2007) reports geochemical evidence suggesting an apparent direct connection between hot springs and the deeper geothermal resource, whereby some geothermal waters travel via piedmont faults directly into Dixie Valley alluvial fill where they mix with shallow groundwater in the unconfined basin-fill aquifers. Most springs in the valley exhibit evidence of shallow groundwater mixing with thermal water before discharging at the ground surface. However, the Dixie Hot Springs are an exception to this and appear to be unaffected by shallow groundwater but instead connected directly to the deeper geothermal system (Blackwell et al. 2007).

To contrast the geothermal and shallower basin-fill aquifers, Huntington et al. (2014) compared selected geothermal data published in Goff et al. (2002) and the Great Basin Center for Geothermal Energy (2009) to collected basin-fill groundwater samples. Samples were collected throughout the Dixie Valley Hydrographic Area (NDWR Basin 128). Several methods of chemical comparisons between basin-fill and geothermal aquifer water indicate that most basin-fill groundwater sampled generally contains 10 to 12 percent geothermal water—a range similar to that of previous findings (Bruton et al. 1997). These results indicate some mixing between the basin-fill and geothermal water aquifers (Huntington et al. 2014).

Similarly, stable isotopes of oxygen-18 and deuterium, and geothermal indicators such as high temperature, lithium, boron, chloride, and silica indicate that geothermal resource mixing occurs in wells that tap the basin-fill aquifer, particularly on the north, south, and west sides of the Dixie Valley groundwater basin (Huntington et al. 2014).

Permeability or upwelling of the geothermal system appears to depend on the opportunity for vertical water movement within the Stillwater Fault and other minor faults at the foot of the Stillwater Range. Conversely, geothermal water entering this fault system deposits silica (Hickman et al. 1997), and permeability would eventually be sealed off by silica precipitation if not for periodic movement of the fault (Zoback 2007). Upwelling continues until the heated water reaches the ground surface (BLM 2011a).

The existing Terra-Gen Dixie Valley Geothermal Facility located north of the lease area provides an opportunity to compare geothermal water attributes with basin-fill water aquifer attributes; this comparison is shown in **Table 12**, below. Based on generally similar geologic and hydrogeologic conditions, the water quality differences between the two aquifers at the Terra-Gen Dixie Valley Geothermal Facility are anticipated to be similar to those exhibited in the proposed lease area.

Table 12
Comparison of Geothermal and Non-Geothermal Groundwater Quality Near the Terra-Gen Dixie Valley Geothermal Facility

Ion Pairs	Geothermal Water Typical Range (meq/liter ¹)	Non-geothermal Water Typical Range (meq/liter ¹)
Sodium + potassium	90 to >95 percent	20 to 80 percent
Calcium + magnesium	<5 to 10 percent	20 to 80 percent
Chloride + sulfate	25 to 90 percent	25 to 85 percent
Bicarbonate + carbonate	5 to 75 percent	5 to 75 percent

Source: Nimz et al. 1999

¹ meq/L = milliequivalents per liter, or milligrams per liter divided by the combining weights of the indicated ions.

Water Rights

According to the NDWR (2016a), as of February 7, 2017, there are a total of 1,065 records in the Dixie Valley Hydrographic Area (Area code 128). Of these, 319 are certificated, permitted, ready for action, ready for action (protested), or vested rights.

There are four vested claims on springs that are held by the current livestock grazing permittee for stockwatering (NDWR 2016a). These claims are on springs in the vicinity of the Dixie Hot Springs and warm and cold springs nearby (all are in Township 22 North, Range 35 East), as follows:

- VI0057—Dixie Meadows Hot Spring (southwest quarter of the southeast quarter, Section 5, Township 22 North, Range 35 East)
- VI0058—Dixie Corral Spring (ID#2192; associated with USGS S25; northeast quarter of the southwest quarter, Section 4, Township 22 North, Range 35 East)
- VI0065—Dixie Meadows Cold Spring (ID#2208; associated with USGS S23; southwest quarter of the northwest quarter, Section 17, Township 22 North, Range 35 East)
- VI0066—Dixie Meadows Seep (ID#2210; northwest quarter of the northeast quarter, Section 19, Township 22 North, Range 35 East)

In addition to the four vested rights listed, there are two active applications (ready for action) held by Churchill County for municipal and quasi-municipal use in Township 22 North, Range 35 East:

- 49800—Southwest quarter of the southwest quarter, Section 4, Township 22 North, Range 35 East; quasi-municipal; underground
- 79627—Southwest quarter of the southeast quarter, Section 5, Township 22 North, Range 35 East; municipal; underground

There are additional water rights in the vicinity of the Dixie Hot Springs; these rights are vested, certificated, permitted, and ready for action (see **Table 13**, below). For the most part, vested rights are used for stock water use, and one right is used for irrigation (NDWR 2016a).

Table 13
Water Rights Summary

Township and Range	CER¹	PER¹	RFA¹	RFP¹	VST¹
T20N R34E	3	1	2	0	0
T21N R34E	5	2	8	0	0
T21N R35E	18	0	0	1	2
T22N R34E	0	0	4	0	0
T22N R35E	0	0	2	0	4
T22N R36E	1	0	0	0	0
T23N R35E	0	0	2	0	3
T23N R36E	0	0	0	0	0
T24N R35E	0	0	0	0	2
T24N R36E	0	8	2	0	1
Sub-Totals	27	11	20	1	12
Total Rights	71				

Source: NDWR 2016b

¹ Water Rights Use Codes:

CER: Certificated

PER: Permitted

RFA: Ready for action

RFP: Ready for action (protested)

VST: Vested

Within the wider hydrographic area, rights are used for the following purposes (NDWR 2016a): commercial, domestic, industrial, irrigation (Carey Act), irrigation, (desert-land entry), irrigation, mining and milling, municipal, other, power, quasi-municipal, stockwatering, and wildlife.

3.3.2 Environmental Consequences

Proposed Action (Northern Gen-tie Route)

The project could affect water resources in several ways: 1) it could degrade surface water quality by increasing erosion and sedimentation, or altering spring-discharged water chemistry; 2) it could alter water quantity by reducing spring discharge rates, decreasing groundwater supply, or interfering substantially with groundwater recharge; or 3) it could alter surface or geothermal water temperatures.

The deep, high-temperature, bedrock-hosted geothermal aquifers, at depths of 3,000 to 5,000 feet, would be used for geothermal power production. Impacts on water quality could occur if geothermal waters were to mix with shallow

groundwater aquifers during project construction or utilization. If geothermal fluids were to mix with shallow groundwater aquifers, adverse impacts on water quality may also be observed in surface water features (springs, seeps, and streams) within the Dixie Meadows area. To prevent water quality impacts on the shallow groundwater reservoirs and associated surface water features during construction activities, the geothermal wells would be cased with steel to a depth well below the shallow groundwater reservoirs in the alluvial fill basins. The casing would be cemented into the ground to prevent the loss of any geothermal resource into, and prevent the contamination or mixing of, any shallow groundwaters by the geothermal production or injection fluid.

To further avoid or minimize adverse impacts on water quality, monitoring wells would be installed at selected sites and target depths to monitor water quality parameters of shallow groundwater reservoirs, surface water features, and geothermal fluids. Frequent monitoring would include establishing triggers to allow for early detection of potential adverse impacts to water quality. If adverse impacts to water quality in groundwater aquifers or surface water features were detected, appropriate mitigation measures would be utilized.

Reserve pits would be constructed at each well pad to contain and temporarily store drilling mud, drill cuttings, stormwater runoff, and the geothermal fluid produced during well testing. Because nontoxic drilling mud would be used, the reserve pits are not proposed to be lined. Additionally, the bentonite drilling muds discharged into the reserve pits would tend to act as a liner, in the same way they prevent the loss of drilling fluids in the well bore into the surrounding rock. Therefore, contamination of the shallow groundwater aquifer from temporary drilling discharges into the reserve pits is unlikely.

If the project were to consume geothermal fluid during operation, geothermal reservoir pressures could fall. This could alter water quantity by reducing spring flows or water levels of groundwater aquifers that may have a hydrologic connection to the geothermal reservoir. If water from the basin-fill aquifer were injected into the geothermal reservoir to maintain suitable production pressures (Benoit et al. 2000), the same impacts could result on springs or overlying groundwater aquifers. However, operating the air-cooled geothermal plants is not anticipated to consume geothermal water resources, as all geothermal fluid used in production would be reinjected back into the geothermal reservoir.

As stated in **Section 2.1.3**, the volume of geothermal fluid reinjected into the reservoir would be slightly less than the volume used due to the lower post-production temperature of the fluid. Because reinjected fluid would have a lower post-production temperature, this could also impact the temperature of springs and groundwater aquifers that may have a connection to the geothermal source. If cooler post-production water mixed with water supplied to the springs, this could lower the temperature of output flow.

Monitoring of springs and groundwater aquifers for temperature, flow, stage, and/or static water levels would occur. Monitoring temperature, groundwater level, and spring flow/stage would allow early detection of potential changes to water quantity or temperature. If adverse impacts to temperature or water quantity in groundwater aquifers or surface water features were detected, appropriate mitigation measures would be utilized. Appropriate monitoring and mitigation strategies would be outlined in the Aquatic Resources Monitoring and Mitigation Plan. Monitoring and mitigation of water quantity would also be applicable to avoid, minimize, or mitigate potential adverse impacts on hydric soils, wetland and riparian areas, aquatic habitat, and special status species.

During initial well testing, a relatively small volume of geothermal fluid would be discharged to the reserve pits. This could potentially reduce the geothermal inflow to seeps and springs, leading to short-term reductions in water quantity discharged and water temperature. However, the volume of fluid withdrawn during the relatively short-duration well tests would be minor compared with the volume of fluid naturally available in the geothermal resource. Removing small volumes of geothermal fluid during testing would be anticipated to have only a short-term, minor impact, if any at all, on the quantity or temperature of surface water expressions at springs in the Project Area. Implementing the Aquatic Resources Monitoring and Mitigation Plan would allow any impacts to be quickly identified and mitigated.

Geothermal water injection is not anticipated to have impacts on surface or shallow groundwater quality. The Underground Injection Control Permit required for the project's injection program from the NDEP Bureau of Water Pollution Control would require that the injection program be designed and monitored to prevent degradation of underground sources of drinking water due to the geothermal fluid injection practices.

Pipelines would carry geothermal fluids from each well pad to the production plants. Should an accidental discharge of geothermal fluid occur during pipeline transport, impacts on geothermal water quantity or surface or groundwater quality and quantity could occur. Over the operational life of the project, accidental discharges of geothermal fluids are unlikely because of the frequent inspections and ultrasonic testing of the geothermal pipelines, the pipeline flow and pressure monitoring, and the well pump and pipeline valve shutdown features; however, should an geothermal fluids be accidentally discharged, operations would be temporarily suspended and the BLM would be notified to determine the appropriate mitigation measures.

Surface disturbance during construction of the power plants, substations, well pads, and access roads could increase erosion and sedimentation to springs downslope and decrease groundwater infiltration and recharge rates. To minimize erosion and sedimentation, stormwater runoff from undisturbed areas around the constructed well pads, power plant sites, and substations would be

directed into ditches surrounding the disturbed areas and back onto undisturbed ground consistent with BLM BMPs for stormwater. Access roads would also be constructed and maintained consistent with the BLM BMPs for road construction applicable to the intended use (temporary or permanent) of the road.

Surface disturbance from gen-tie construction could impact springs in the northern portion of Dixie Meadows as described above. Additionally, surface flow patterns could be altered as a result of gen-tie and access road construction, which could cause indirect impacts on water quantity, infiltration, and recharge rates, and other associated resources (e.g., hydric soils, wetlands and riparian areas, and aquatic habitat for special status species). To minimize impacts, ORNI 32 would implement the Aquatic Resources Monitoring and Mitigation Plan. Implementing the plan would allow any impacts to be avoided, minimized, or mitigated, as necessary.

If adverse impacts were observed following avoidance measures, ORNI 32, in consultation with the BLM Authorized Officer, would apply mitigation measures outlined in the Aquatic Resources Monitoring and Mitigation Plan to reduce these impacts.

Contamination of surface or groundwaters from spills of petroleum products (such as diesel fuel or lubricants) could also occur. However, this is unlikely because the well pads and power plant sites, where most petroleum products would be used and stored, would be bermed to contain and control any spills. As described in **Section 3.17**, Public Health and Safety and Hazardous Materials, any spill of hazardous waste or hydrocarbons would be remediated by following all local, state, and federal regulations. This would reduce potential spill-related impacts on water quality by ensuring cleanup would occur in a more expedited manner. ORNI 32 would also notify NDEP and the BLM. It also may be necessary to temporarily amend the Aquatic Resources Mitigation and Monitoring Plan, in coordination with the BLM, should such a spill occur, to account for altered conditions.

Water for construction would be obtained from drilling up to two temporary, nonpotable water wells outside of the immediate geothermal production area. The wells would be permitted under a geothermal waiver by the NDWR and approved by the BLM. The wells would be drilled to a productive interval of sands, gravels, or fractures (estimated at approximately 500 feet). Water consumption for construction (17.6 acre-feet for 1 year of construction) and operation (2.5 to 3.0 acre-feet per year) is minor, compared with the overall aquifer perennial yield of 15,000 acre-feet (NDWR 2016b).

Because the Dixie Valley Hydrographic Area (Basin 128) is designated by the state engineer as over-appropriated, groundwater consumption may have temporary impacts on groundwater quantity. This would be the case if overall consumption were to exceed the perennial yield. Impacts could decrease

surface expression at basin springs. Potential impacts would be identified by monitoring surface expression, in accordance with Aquatic Resources Monitoring and Mitigation Plan (**Section 2.1.6**). If adverse impacts were observed, ORNI 32, in consultation with the BLM Authorized Officer, would apply mitigation measures as needed to reduce them.

If the quantity of surface water discharge were affected by constructing or operating the geothermal plants, vested and other water rights on nearby springs could be indirectly impacted. Adverse impacts could occur if spring flow were reduced or stopped, which would result in permittees being unable to fulfill their water rights' intended beneficial use, such as watering stock or irrigating crops. If adverse impacts were observed, ORNI 32, in consultation with the BLM Authorized Officer, would apply mitigation measures as needed to reduce them. Mitigation measures would be outlined in the Aquatic Resources Monitoring and Mitigation Plan. They could include temporarily suspending project operations until discharge rates return to appropriate levels.

Mitigation measures for water resources are as follows:

- ORNI 32 would develop and implement the Aquatic Resources Monitoring and Mitigation Plan. Implementing the plan would allow any direct or indirect adverse impacts on water resources to be avoided, minimized, and mitigated as needed. This plan would be developed in coordination with the BLM, Ormat, and the cooperating agencies and finalized prior to a decision for the project.
- The project would be in compliance with BLM Manual 7240, Water Quality Manual (P) and BLM Manual 7250, Water Rights Manual (P).
- Monitoring wells and stream gauges would be installed at a timing that allows for the collection of sufficient baseline data. A minimum of two monitoring wells and two stream gauges would be installed at preselected locations. The timing of installation and site locations would be determined by the BLM, Ormat, and the cooperating agencies in conjunction with development of the Aquatic Resources Monitoring and Mitigation Plan. Additional monitoring locations would also be incorporated into the plan as necessary.
- Monitoring data would be collected and analyzed by an independent third party as approved by the BLM. The frequency of data collection and reporting would be determined by the BLM, Ormat, and the cooperating agencies in conjunction with development of the Aquatic Resources Monitoring and Mitigation Plan.
- Water resources would be monitored for specific parameters, including water quantity, quality, and temperature. Additional parameters would be included as necessary in the development of

the Aquatic Resources Monitoring and Mitigation Plan in consultation with the BLM, Ormat, and the cooperating agencies.

- Surface water resources within Dixie Meadows would be delineated to include locations of springs, seeps, and outflow patterns, and included in the wetland delineation (see **Section 3.9**, Wetland and Riparian Areas); these would include BLM- and US Navy-administered lands.
- Once the wetland delineation is complete, an appropriate surface disturbance avoidance buffer would apply to specific surface water resources (springs and seeps; see full lease stipulations in **Appendix A**) identified by the BLM from the wetland delineation. The buffer would ensure adequate protection of surface water resources.
- Transmission towers would be sited to span identified water resources as defined by the wetland delineation. String sites and other temporary work areas would be sited outside of identified surface water resources.
- ROW construction activities would be designed to not inhibit natural surface flow patterns.

The following are additional mitigation measures that could be applied if adverse impacts on water quality, quantity, or temperature are observed:

- Temporarily suspending geothermal reservoir utilization or reinjection.
- Changing the depth of geothermal fluid injection in one or more geothermal unit area injection wells.
- Relocating one or more production or injection wells within the geothermal unit area.

Alternative 1 (Southern Gen-tie Route)

Impacts on water resources would be similar to those under the Proposed Action; however, there are no springs or seeps along the southern gen-tie ROW, so direct impacts on these features are not anticipated.

The southern gen-tie ROW does cross several ephemeral drainages that may flow into or near the cold springs and seeps in the southern portion of the Dixie Meadows area (T22N, R35E, Sections 18 and 19). These features are between 1,700 and 2,100 feet from the southern gen-tie alignment. Because these springs are believed to be fed by groundwater, as opposed to surface recharge from ephemeral drainages, impacts on the quantity or temperature of surface discharge from the springs from project construction is unlikely; however, erosion from ROW construction could increase sedimentation to these springs and decrease groundwater infiltration and recharge rates. To avoid

or minimize impacts, construction access would use existing routes to the extent possible. Where access is necessary and no reasonable access roads exist, ORNI 32 would use overland travel to access the ROW. Surface grading or vegetation clearing for gen-tie construction would occur only when absolutely necessary for safe access or for installing the conductors; it would occur only within the proposed ROW. Any surface disturbance would comply with BLM BMPs.

Potential impacts on geothermal resources and water rights under Alternative I would be the same as described under the Proposed Action.

No Action Alternative

Under the No Action Alternative, the BLM would not approve the Proposed Action, the facilities would not be constructed, and ORNI 32 would likely suspend exploration activities authorized under the two previous Decision Records for the foreseeable future. As such, there would be no change in existing water resources conditions at the site.

3.4 SOIL RESOURCES

3.4.1 Affected Environment

The Project Area, including the gen-tie corridors for the Proposed Action and Alternative I, overlaps 29 soil map units. **Table 14**, Gen-Tie Soil Map Units (Miles), lists the length of the northern and southern gen-tie alignments covered by each soil map unit. Soils in the Project Area are depicted on **Figure 7**, Soil Resources.

As shown in **Table 14**, the three soil map units underlying the greatest length of the gen-tie alignments are the Slaw-Trocken-Chuckles association, Bluewing-Pineval association, and Mazuma very fine sandy loam, 0 to 4 percent slopes. The Pelic-Turupah complex, 0 to 1 percent slopes, are hydric soils that underlie most wetland and riparian areas in Dixie Meadows; these soils comprise approximately 1 percent of soils in the Proposed Action area but are included in this analysis due to their uniqueness in the Project Area.

The candidate power plant locations are located entirely within the Bluewing-Pineval association. Most well pads are also in the Bluewing-Pineval association; the southernmost two pads are in the Slaw-Trocken-Chuckles association.

The soil series comprising these four map units are described in detail below.

Slaw-Trocken-Chuckles association

The Slaw series consists of very deep, well drained soils that formed in alluvium over lacustrine deposits derived from mixed rocks. Slaw soils are on alluvial flats, floodplains, basin floors, lake plains, floodplain playas, drainageways, and low stream terraces. Slopes are 0 to 4 percent.

Table 14
Gen-Tie Soil Map Units (Miles)

Soil Map Unit (Key Number)	Proposed Action (miles) (Percent Total)	Alternative 1 (miles) (Percent Total)	Landscape Position Percent Slope	Surface Texture	Wind Erosion Hazard¹	Water Erosion Hazard²
Appian-Juva-Bango association (476513)		1.8 (6%)	Bolsons, ³ lake terraces, drainageways 0 to 2%	Loam	5	Slight
Bluewing-Inmo association (476468)		1.3 (4%)	Inset fans and fan piedmonts ⁴ 2 to 8%	Very cobbly loam	7	Slight
Bluewing-Pineval association (476471)	7.9 (17%)	3.0 (10%)	Fan piedmonts, drainageways, inset fans 4 to 8%	Very gravelly loamy sand	3	Slight
Bango-Stumble association (476499)		1.7 (6%)	Lake terraces, bolsons, sand sheets 0 to 4%	Sandy loam	3	Slight
Chuckles-Bango association (476572)		3.4 (11%)	Bolsons, lake terraces 0 to 2%	Loam	5	Slight
Genegraf-Rednik-Trocken association (476426)		2.9 (10%)	Fan remnants, fan piedmonts 2 to 15%	Gravelly fine sandy loam	5	Slight
Hessing-Dun Glen-Bango association (476594)	1.3 (3%)		Fan piedmonts, fan skirts 2 to 4%	Silt loam	5	Slight
Hessing-Wholan-Dun Glen association (476593)	0.5 (1%)		Fan piedmonts, fan skirts 0 to 4%	Silt loam	5	Slight
Jerval-Chilper-Bluewing association (475203)	0.9 (2%)		Fan piedmonts, fan remnants 2 to 8%	Loam	5	Slight

Table 14
Gen-Tie Soil Map Units (Miles)

Soil Map Unit (Key Number)	Proposed Action (miles) (Percent Total)	Alternative I (miles) (Percent Total)	Landscape Position Percent Slope	Surface Texture	Wind Erosion Hazard¹	Water Erosion Hazard²
Juva-Wholan-Stumble association (476591)		4.8 (16%)	Fan piedmonts, fan skirts 0 to 4%	Loam	5	Slight
Mazuma very fine sandy loam, 0 to 4 percent slopes (476639)	5.7 (12%)		Fan skirts, bolsons 0 to 4%	Very fine sandy loam	3	Slight
Mazuma-Yipor association (475345)	4.0 (9%)		Lake plains 0 to 2%	Very fine sandy loam	4	Slight
Misad-Golconda-Tenabo association (475302)	2.6 (6%)		Fan piedmonts, fan skirts, fan remnants 2 to 8%	Gravelly very fine sandy loam	5	Slight
Oxcorel-Whirlo-Trocken variant association (475296)	1.6 (3%)		Fan piedmonts, fan remnants, fan collars, inset fans 2 to 8%	Gravelly very fine sandy loam	5	Slight
Pelic-Turupah complex, 0 to 1 percent slopes (476696)	0.4 (1%)		Flood plains, delta plains 0 to 2%	Sand	8	Slight
Playas (476684)	0.2 (<1%)		No data	Silty clay	4	Not rated
Preble variant-Whirlo association (475242)	0.5 (1%)		Bolsons, alluvial flats, fan aprons 2 to 8%	Very fine sandy loam	3	Slight
Rednik-Trocken-Bluewing association (476531)		2.8 (9%)	Fan piedmonts, fan remnants, inset fans 4 to 8%	Very gravelly sandy loam	6	Slight

Table 14
Gen-Tie Soil Map Units (Miles)

Soil Map Unit (Key Number)	Proposed Action (miles) (Percent Total)	Alternative I (miles) (Percent Total)	Landscape Position Percent Slope	Surface Texture	Wind Erosion Hazard¹	Water Erosion Hazard²
Rednik-Trocken-Genegra association (476532)	0.6 (1%)	0.2 (<1%)	Fan remnants, fan piedmonts, beach terraces 2 to 8%	Very gravelly sandy loam	6	Slight
Settlement-Louderback-Rustigate association (476546)	2.1 (5%)		Lake terraces, bolsons 0 to 2%	Silty clay	4	Slight
Slaw-Chuckles association (476549)	1.2 (3%)		Stream terraces, semi-bolsons, lake terraces 0 to 2%	Silt loam	5	Slight
Slaw-Juva-Wholan association (476548)		3.1 (10%)	Stream terraces, semi-bolsons, inset fans 0 to 2%	Silt loam	5	Slight
Slaw-Mazuma-Hessing association (476550)	1.9 (4%)		Stream terraces, semi-bolsons, lake terraces, beach plains 0 to 4%	Silt loam	5	Slight
Slaw-Trocken-Chuckles association (476551)	10.2 (22%)	4.5 (15%)	Stream terraces, semi-bolsons, inset fans, lake terraces 0 to 4%	Silt loam	5	Slight
Trocken-Bluewing association (476518)		1.8 (6%)	Fan piedmonts, alluvial fans, inset fans 2 to 8%	Gravelly loamy sand	2	Slight

Table 14
Gen-Tie Soil Map Units (Miles)

Soil Map Unit (Key Number)	Proposed Action (miles) (Percent Total)	Alternative I (miles) (Percent Total)	Landscape Position Percent Slope	Surface Texture	Wind Erosion Hazard¹	Water Erosion Hazard²
Weso very fine sandy loam, 0 to 2 percent slopes (475289)	2.0 (4%)		Fan piedmonts, fan skirts 0 to 2%	Very fine sandy loam	3	Slight
Whirlo-Beoska-Oxcorel association (475249)	2.1 (5%)		Fan piedmonts, fan skirts, fan remnants 2 to 8%	Very gravelly loam	7	Slight
Wholan very fine sandy loam, rarely flooded, 0 to 2 percent slopes (475169)	2.5 (5%)		Fan piedmonts, fan skirts 0 to 2%	Very fine sandy loam	3	Slight
Yipor silt loam, sandy substratum (475176)	0.1 (<1%)		Semi-bolsons, stream terraces 0 to 2%	Silt loam	4	Slight

Source: NRCS 2016; NRCS GIS 2016

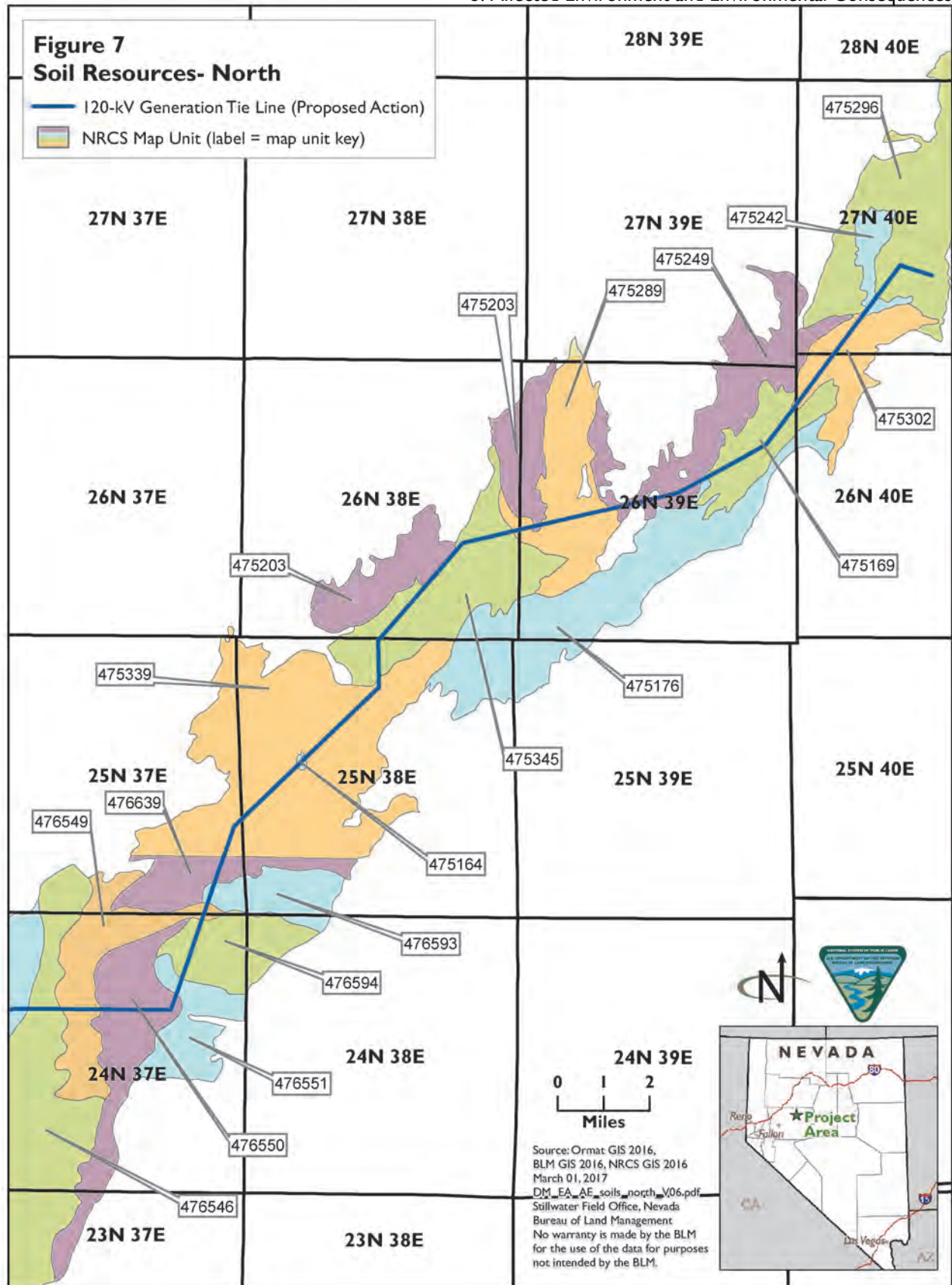
¹ Wind erosion potential is classified on a scale between 1 and 8, with a rating of 1 for soils that are highly susceptible to wind erosion, and a rating of 8 for soils that are the least susceptible to wind erosion.

² The hazard is described as slight, moderate, severe, or very severe.

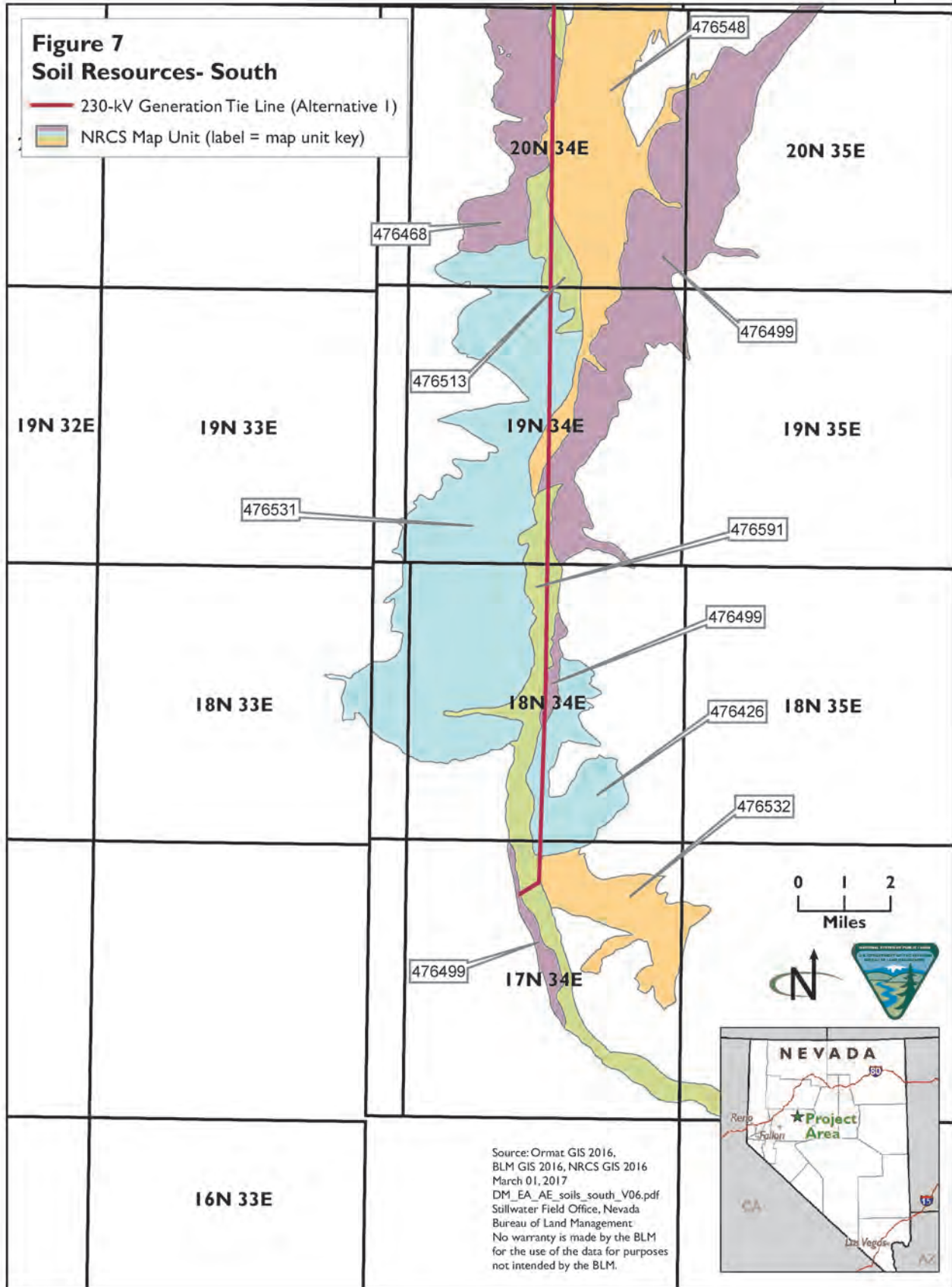
³ A semiarid, flat-floored desert valley or depression, usually centered on a playa or salt pan and entirely surrounded by hills or mountains

⁴ A landform created at the foot of a mountain or mountains by debris deposited by shifting streams

3. Affected Environment and Environmental Consequences



3. Affected Environment and Environmental Consequences



The Trocken series consists of very deep, well drained soils that formed in alluvium derived from mixed rocks. Trocken soils are on alluvial fans, fan remnants, inset fans, fan skirts, longshore bars, barrier beaches, beach terraces, and lake terraces. Slopes are 0 to 30 percent.

The Chuckles series consists of very deep, moderately well drained soils that formed in alluvium derived from mixed rocks over lacustrine sediments. Chuckles soils are on lake plains, lake terraces, and lagoons. Slopes are 0 to 2 percent (NRCS 2016).

Bluewing-Pineval association

The Bluewing series consists of very deep, excessively drained soils that formed in alluvium derived from mixed rocks. Bluewing soils are on fan remnants, beach plains, alluvial fans, and inset fans. Slopes are 0 to 30 percent.

The Pineval series consists of very deep, well drained soils that formed in alluvium derived from volcanic or mixed rocks. Pineval soils are on fan remnants and fan aprons. Slopes are 2 to 30 percent (NRCS 2016).

Mazuma very fine sandy loam, 0 to 4 percent slopes

The Mazuma series consists of very deep, well drained soils that formed in alluvium and lacustrine deposits derived from mixed rocks. Mazuma soils are on basin-floor remnants, lagoons, beach plains, alluvial flats, fan skirts, and stream terraces. Slopes are 0 to 30 percent (NRCS 2016).

The proposed wells and candidate power plant locations overlie the Bluewing-Pineval association, described above.

Pelic-Turupah complex, 0 to 1 percent slopes

The Pelic-Turupah complex, 0 to 1 percent slopes, consists of very poorly drained soils that formed from alluvium derived from mixed parent materials. Pelic-Turupah soils are on floodplains. Slopes are 0 to 2 percent for Pelic soils and 0 to 1 percent for Turupah soils (NRCS 2016). This soil map unit underlies most wetlands in Dixie Meadows.

This soil map unit is considered hydric. Hydric soils form under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (*Federal Register* 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of wetland vegetation.

Soil Erosion

The soils within the Project Area have been classified by NRCS for soil erosion susceptibility by wind or water. The wind erodibility group consists of soils that have similar properties affecting their susceptibility to wind erosion, and are classified on a scale between 1 and 8. A rating of 1 is given to soils that are

highly susceptible to wind erosion, and a rating of 8 is given to soils that are the least susceptible to wind erosion (NRCS 2016). The Bluewing-Pineval association and Mazuma very fine sandy loam, 0 to 4 percent slopes soil unit both have ratings of 3, while the Slaw-Trocken-Chuckles association has a rating of 5. The Pelic-Turupah complex, 0 to 1 percent slopes, has a rating of 8.

The susceptibility of a soil to sheet and rill erosion by water was also classified and rated by NRCS. There are two rating estimates, the soil K factor (whole soil) and the erosion hazard. Soil K factor estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity, and indicates the erodibility of the whole soil (including the presence of rock fragments). The ratings for erosion hazard indicate the hazard of soil loss caused by sheet or rill erosion in areas where 50 to 75 percent of the soil surface has been exposed by logging, grazing, mining, or other kinds of disturbance. The ratings for erosion hazard are based on slope and soil erosion K factor. The hazard for both ratings are described as slight, moderate, severe, or very severe. A rating of slight indicates erosion is unlikely under ordinary climatic conditions (NRCS 2016). The hazard of soil loss to sheet and rill erosion by water is slight for the Bluewing-Pineval and Slaw-Trocken-Chuckles associations and the Mazuma very fine sandy loam, 0 to 4 percent slopes and Pelic-Turupah complex, 0 to 1 percent slopes units.

Fugitive Dust Potential

The soils within the Project Area have been rated by NRCS for their ability to resist the formation of fugitive dust emissions. This interpretation rates the vulnerability of a soil for eroded soil particles to go into suspension during a windstorm. The NRCS has rated soils for fugitive dust resistance to indicate the extent to which the soil features affect the formation of dust. Low resistance indicates the soil has features very favorable for the formation of dust; moderate resistance indicates the soil has features favorable for dust formation; and high resistance indicates the soil has features unfavorable for dust formation (NRCS 2016). The Slaw-Trocken-Chuckles association and the Mazuma very fine sandy loam, 0 to 4 percent slopes unit have low resistance to fugitive dust formation, while the Bluewing-Pineval association and Pelic-Turupah complex, 0 to 1 percent slopes, have moderate resistance to fugitive dust formation.

Soil Compaction

The soils within the Project Area have been classified by NRCS for soil compaction. Soil compaction is an important factor related to soil erosion as it tends to reduce water infiltration and increase runoff, which generally increases soil erosion rates. Each soil is rated for its resistance to compaction, which is predominantly influenced by moisture content; depth to saturation; percent of sand, silt, and clay; soil structure; organic matter content; and content of coarse fragments. A rating of high resistance indicates the soil is very favorable to resisting compaction; moderate resistance indicates the soil is favorable to resisting compaction; and low resistance indicates the soil has one or more

factors that favor the formation of a compacted layer (NRCS 2016). The Slaw-Trocken-Chuckles association and the Pelic-Turupah complex, 0 to 1 percent slopes, have a low resistance to soil compaction; the Mazuma very fine sandy loam, 0 to 4 percent slopes unit has a moderate resistance to soil compaction; and the Bluewing-Pineval association has high resistance to soil compaction.

Soil Restoration Potential

Soils within the Project Area have been rated for their restoration potential and their inherent ability to recover from degradation, which is often referred to as soil resilience. The ability for a soil to recover from degradation means the ability to restore functional and structural integrity after a disturbance. Some soil functions important for restoration include sustaining biological activity, diversity, and productivity; capturing, storage, and release of water; storing and cycling nutrients and other elements; and providing support for plant and animal life. Restoration goals may include reestablishment of a preferred natural plant assemblage of the site. Soil resilience is dependent upon adequate stores of organic matter, good soil structure, low salt and sodium levels, adequate nutrient levels, microbial biomass and diversity, adequate precipitation for recovery, and other soil properties (NRCS 2016).

Rating class terms for soil restoration potential indicate the extent to which the soils are made suitable by the soil features that affect the soil's ability to recover. High potential indicates the soil has features very favorable for recovery, and good performance should be expected; moderate potential indicates the soil has features generally favorable for recovery, and fair performance can be expected; low potential indicates the soil has one or more features unfavorable for recovery, and poor performance can be expected. The Slaw-Trocken-Chuckles association, Bluewing-Pineval association, the Mazuma very fine sandy loam, 0 to 4 percent slopes unit, and Pelic-Turupah complex, 0 to 1 percent slopes unit, all have low potential for soil restoration.

3.4.2 Environmental Consequences

Proposed Action (Northern Gen-tie Route)

Under the Proposed Action, up to 1,982 acres of soils would be disturbed. Of these 1,982 acres, approximately 1,860 acres of disturbance would be reclaimed and 122 acres of disturbance would not be reclaimed.

The Proposed Action could result in several effects on soils by (1) increasing erosion rates from grading and clearing of site, and/or (2) reducing soil productivity and potential restoration success, by compacting the soil to a level that prevents successful rehabilitation and eventual reestablishment of vegetative cover to preconstruction composition and density.

Soil ratings of the three most prevalent soil map units in the Project Action Area and the Pelic-Turupah complex, 0 to 1 percent slopes unit suggest the susceptibility to sheet and rill erosion by water is slight. However, the

susceptibility of these soils to wind erosion ranges from low to moderately high, and resistance to dust formation is low to moderate. The soils range from low to high in ability to resist compaction; however, these soils all rate low for their potential for soil recovery due to low amounts of available precipitation received annually.

The Proposed Action would disturb soil through clearing and grading during construction; protective vegetation, surface rock fragments, and soil structure would be removed and/or disturbed. Removal of vegetation and soil surface during construction would expose soil and increase the potential for wind- and water-driven erosion and soil compaction. The project site has generally flat topography, but grading would be performed on an as-needed basis to achieve the necessary slope and elevation for new facilities. This region also has the potential for high winds and infrequent strong rains, which could lead to increased erosion rates and soil loss. The use of vehicles and equipment on these disturbed areas could further increase the potential for wind- and water-driven erosion, as well as contributing to soil compaction, thus reducing restoration potential.

Hydric soils have been delineated by NRCS and occur within the Pelic-Turupah complex, 0 to 1 percent slopes. Direct impacts on hydric soils would occur from constructing the northern gen-tie alignment and the potential installation of access roads. In general, overland travel on this soil unit would carry a high risk for soil compaction. The risk would be greater if overland travel were to occur when soils are wet. Soil compaction reduces infiltration and causes soils to lose their ability to store and hold water, potentially leading to reduction or loss of soil saturation. Potential reduction of infiltration rates and soil saturation could cause indirect impacts on wetland vegetation, and potentially lead to reduced cover and further impacts from erosion. Soil compaction would also reduce the potential for successful revegetation of disturbed areas.

Construction activities associated with installation of the northern gen-tie alignment would cause direct impacts on hydric soils if grading and clearing of vegetation were to occur. Grading and vegetation removal would strip protective topsoil and expose the soil surface, potentially leading to higher rates of erosion.

Indirect impacts on hydric soils could occur from utilization and injection of geothermal fluids during operations or from installation of the proposed northern gen-tie alignment. If water quantity were affected by project operations (utilization and injection), it could potentially cause reduction or loss of soil saturation. Additionally, if the proposed northern gen-tie alignment were to alter natural surface flow patterns this could affect the hydrologic functions of these soils. If water quality were affected by project operations, this could affect nutrients stored in the hydric soils and in turn potentially lead to a loss of wetland and riparian vegetation.

To minimize impacts on hydric soils in the Pelic-Turupah complex, 0 to 1 percent slopes unit, mitigation would be implemented in accordance with the Aquatic Resources Monitoring and Mitigation Plan. Mitigation for impacts on hydric soils within the Pelic-Turupah complex, 0 to 1 percent slopes is as follows:

- ORNI 32 would develop and implement the Aquatic Resources Monitoring and Mitigation Plan. Implementing the plan would allow any direct or indirect impacts on hydric soils to be avoided, minimized, and mitigated as needed. This plan would be developed in coordination with the BLM, Ormat, and the cooperating agencies and finalized prior to a decision for the project.
- Hydric soils would be mapped, as identified by the presence of wetland vegetation, and included in the wetland delineation (see **Section 3.9**, Wetlands and Riparian Areas). This would allow sensitive resource areas to be delineated for appropriate buffers.
- Once delineation is complete, an appropriate surface disturbance avoidance buffer would apply to all hydric soils (see full lease stipulations in **Appendix A**). The buffer would ensure adequate protection of hydric soils.
- Transmission towers would be sited to span identified hydric soils as defined by the wetland delineation. String sites and other temporary work areas would be sited outside of identified hydric soils.
- Surface grading or vegetation clearing would not occur on specific hydric soils as identified by the BLM from the wetland delineation.
- Surface grading or vegetation clearing for gen-tie construction would occur only when absolutely necessary for safe access or installation of the conductors, and would only occur within the proposed ROW. If surface grading or vegetation removal is necessary within pre-identified hydric soils, ORNI 32 would notify and acquire authorization from the BLM Authorized Officer prior to project activity. Additionally, the BLM hydrologist and wildlife biologist would be on-site during associated activities to ensure impacts on resources are minimized.
- Where access is necessary and no reasonable access roads exist, overland travel would be used to access the ROW. If overland travel is necessary within pre-identified hydric soils, ORNI 32 would notify and acquire authorization from the BLM Authorized Officer prior to project activity. Additionally, the BLM hydrologist and wildlife biologist would be on-site during associated activities to ensure impacts on resources are minimized.

- If overland travel were required on hydric soils, every effort would be made to limit overland travel to the late fall or early winter. This is when water levels are low.

To reduce the potential for water-driven erosion in the Project Area and any downgradient parcels, ORNI 32 would adhere to BMPs for access road construction, would minimize cut and fill activities, and would incorporate design features at the power plant sites to reduce erosion from stormwater runoff.

Minimal grading and road construction BMPs would maintain existing stormwater drainage patterns and allow stormwater flows to pass through the area, to the extent possible. Construction-related erosion would be further controlled by implementing a stormwater pollution prevention plan (SWPPP), as required by the NDEP Bureau of Water Pollution Control, for projects that disturb over 1 acre.

To reduce the potential for wind-driven soil erosion, the speed limit on all Project Area roads (including Dixie Valley Road) would be 25 miles per hour. Periodically watering construction roads would help prevent fugitive dust generation and would minimize soil loss from wind erosion. Reducing speed limits would also lessen soil compaction impacts and would aid in soil restoration and recovery.

To reduce the potential for soil loss from wind- and water-driven erosion, all drill pads and new access roads would be covered in 4 to 6 inches of gravel to create an all-weather, all-season surface. This surface would promote soil stability and would minimize soil loss and dust generation.

Temporarily disturbed areas would be restored following construction, which would promote soil stabilization in the long term. To increase the potential of restoration success, topsoil would be salvaged, stockpiled, and seeded during site preparation; it would then be used for site reclamation. Seeding stockpiled topsoil would encourage organic matter accumulation, higher rates of vegetation growth, and restoration success.

These measures would reduce the potential for wind- and water-born erosion and soil compaction and would increase soil restoration potential. However, localized loss of topsoil from wind- and water-driven erosion would still be expected.

Alternative 1 (Southern Gen-tie Route)

Impacts under Alternative 1 would be similar those described for the Proposed Action except that the southern gen-tie alignment does not overlap any Pelic-Turupah complex, 0 to 1 percent slopes soil units, so impacts on these soils are not anticipated.

No Action Alternative

Under the No Action Alternative, the BLM would not approve the Proposed Action, the facilities would not be constructed, and ORNI 32 would likely suspend exploration activities authorized under the two previous Decision Records for the foreseeable future. As such, there would be no change in existing soil resources conditions at the site.

3.5 MIGRATORY BIRDS**3.5.1 Affected Environment**

On January 11, 2001, President Clinton signed Executive Order 13186 placing emphasis on the conservation and management of migratory birds. Migratory birds are protected under the Migratory Bird Treaty Act (MBTA) of 1918, and the Executive Order addresses the responsibilities of federal agencies to protect migratory birds by taking actions to implement the MBTA. BLM management for migratory bird species on BLM-administered lands is based on Instruction Memorandum No. 2008-050 (BLM 2007b). Based on this Instruction Memorandum, migratory bird species of conservation concern include Species of Conservation Concern and Game Birds Below Desired Condition. These lists were updated in 2008 (USFWS 2008).

There is also a memorandum of understanding (MOU) between the BLM and USFWS to promote the conservation of migratory birds. The purpose of the MOU is to strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and avoid or minimize adverse impacts on migratory birds through enhanced collaboration between the two agencies, in coordination with state, tribal, and local governments. The USFWS has also outlined a plan to conserve and protect migratory birds in its Migratory Bird Strategic Plan 2004-2014. The strategy includes direct collaboration with the BLM in making land use and planning decisions (USFWS 2004).

Migratory Birds

A field survey of the geothermal lease areas and northern gen-tie line route was conducted by two EMPSi biologists between May 28 and 30, 2011. The survey included the area encompassing potential power plant sites and included a buffer of 250 feet on either side of the proposed northern gen-tie line. Additional biological surveys were previously conducted within the original 4.9-acre Dixie Meadows lease area in 2009 (CH2M HILL 2009 in BLM 2010; see Figure 1 in EMPSi 2016). Two EMPSi biologists conducted additional field surveys on June 14 and 15, 2016. The survey covered approximately 400 acres of previously unsurveyed portions of the Project Area, as well as portions of the current northern gen-tie alignment that are outside the 500-foot-wide buffer originally surveyed in 2011.

Based on the habitats observed, numerous migratory bird species have the potential to occur within the Project Area. Thirty-three bird species were

observed within and near the Project Area during field surveys, including passerines such as western wood pewee (*Contopus sordidulus*), black-throated sparrow (*Amphispiza bilineata*), horned lark (*Eremophila alpestris*), and raptors such as red-tailed hawk (*Buteo jamaicensis*) and northern harrier (*Circus cyaneus*). Complete lists of species observed during field surveys are included as Appendix D of the Biological Survey Report (EMPSi 2016).

Two active common raven (*Corvus corax*) nests were observed in the northern Dixie Valley during 2016 surveys. One nest was built in a small utility structure within the gen-tie survey buffer. A second nest was in a salt cedar (*Tamarix* sp.) shrub outside of the survey buffer, along Dixie Valley Road. Both nests contained several young that were approaching fledging age (EMPSi 2016).

Surveys for migratory birds were conducted within the geothermal lease areas and southern gen-tie line route and within a 1-mile buffer of this route, between June and August 2013 (WRC 2013). Most of the species recorded during the 2013 surveys are common in the habitat types, such as the horned lark and black-throated sparrow. Overall species diversity is low, likely due to the time of year the survey was conducted, the uniformity of the habitat, and lack of structural diversity and water. A list of all bird species observed during the 2013 surveys is included as Appendix D of the biological survey report (WRC 2013).

EMPSi coordinated with the Great Basin Bird Observatory (GBBO) to gain additional data on migratory birds observed near the Proposed Action.⁴ GBBO provided point count data for five migratory bird transects within 6.2 miles (10 kilometers) of the Proposed Action (GBBO 2016). All point count surveys were conducted in June 2013. Migratory birds commonly observed by GBBO are black-throated sparrow and horned lark; for both species, breeding behavior was displayed at multiple point count locations. Breeding mourning dove (*Zenaida macroura*) was also observed. Nineteen species were observed by GBBO on the five transects.

GBBO observed several USFWS Birds of Conservation Concern; these are sage sparrow (*Amphispiza belli*) and sage thrasher (*Oreoscoptes montanus*). Both species have potential to occur in the vicinity of the Proposed Action due to the presence of suitable habitat, as summarized below. GBBO observed loggerhead shrike (*Lanius ludovicianus*) and Brewer's sparrow (*Spizella breweri*) on one transect each; breeding behavior was not displayed for either species. Sage thrasher, loggerhead shrike, and Brewer's sparrow are BLM sensitive species and are further discussed in **Section 3.8**, BLM Sensitive Species.

Additional species reported by GBBO are red-tailed hawk, barn swallow (*Hirundo rustica*), blue-gray gnatcatcher (*Poliophtila caerulea*), common nighthawk (*Chordeiles*

⁴ GBBO has not been formally consulted through a contract agreement. GBBO played no role in the project other than providing data.

minor), house finch (*Haemorhous mexicanus*), killdeer (*Charadrius vociferus*), northern mockingbird (*Mimus polyglottos*), rock wren (*Salpinctes obsoletus*), western kingbird (*Tyrannus verticalis*), and western meadowlark (*Sturnella neglecta*; GBBO 2016).

Finally, the 430,500-acre Lahontan Valley Wetlands Important Bird Area (IBA) is located approximately 12 to 13 miles west of the Proposed Action. The IBA forms the most important waterfowl breeding and migratory site in Nevada and is critical to many species using the Pacific Flyway (Audubon Society 2016). Species using this important bird area may also use habitats in the Dixie Valley or Jersey Valley.

Habitats found within the Project Area that support life requisites of migratory birds are described in detail in **Section 3.7**, Wildlife and Key Habitat.

Birds of Conservation Concern

Birds of Conservation Concern for Bird Conservation in Region 9 (Great Basin Region) that were observed in the Project Area, or which could potentially occur within the Project Area, are presented in **Table 15**. Birds of conservation concern that are also BLM sensitive species, such as the loggerhead shrike and sage thrasher, are discussed in **Section 3.8**, BLM Sensitive Species.

Table 15
Birds of Conservation Concern

Species	Habitat	Potential for Occurrence
Sage sparrow <i>Amphispiza belli</i>	Treeless sagebrush or salt desert shrubland, with little or no cheatgrass invasion.	Potential to occur.
Long-billed curlew <i>Numenius americanus</i>	Grasslands and irrigated agricultural fields.	Potential to occur. Detected within 1 mile of Project Area.
Green-tailed towhee <i>Pipilo chlorurus</i>	Thickets, chaparral, shrublands, riparian scrub, and especially sagebrush.	Potential to occur.
Eared grebe <i>Podiceps nigricollis</i>	Marshes, ponds and lakes; in migration and winter also salt lakes, bays, estuaries and seacoasts. Nests in areas with seasonal to permanent water.	Potential to occur.
American avocet <i>Recurvirostra americana</i>	Open flats or areas with scattered tufts of grass on islands or along lakes (especially alkaline) and marshes.	The US Navy at NAS Fallon has observed species in Dixie Valley Settlement Area.
Calliope hummingbird <i>Stellula calliope</i>	Mountains; along meadows, canyons and streams, in migration and winter also in chaparral, lowland brushy areas, deserts.	Wintering habitat present; potential to winter in Project Area.

Sources: EMPSi 2016; USFWS 2008; 2016; WRC 2013; GBBO 2010; NatureServe 2015; Wildlife Action Plan Team 2012

Game Birds Below Desired Condition

USFWS Game Birds Below Desired Condition that have been observed within or could potentially occur within the Project Area are presented in **Table 16**, below. This table represents species whose population are below long-term averages or management goals, or for which there is evidence of declining population trends (USFWS 2013). One species has been observed within the Project Area. Five additional species have been observed adjacent to the Project Area within the Dixie Valley, and have potential to occur within the Project Area (EMPSi 2016; WRC 2013).

Table 16
Game Birds Below Desired Condition

Species	Habitat	Potential for Occurrence
Canvasback <i>Aythya valisineria</i>	Marshes, ponds, lakes, rivers, and bays.	Potential to occur. Observed within Dixie Meadows during 2009 surveys.
Ring-necked duck <i>Aythya collaris</i>	Marshes, lakes, rivers, swamps, especially in wooded areas.	Potential to occur. Observed within Dixie Meadows during 2009 surveys.
Wood duck <i>Aix sponsa</i>	Quiet inland waters near woodland, such as wooded swamps, ponds, marshes, and along streams.	Potential to occur. Observed within Dixie Meadows during 2009 surveys.
Northern pintail <i>Anas acuta</i>	Lakes, rivers, marshes, and ponds in grasslands, barrens, dry tundra, or cultivated fields.	Potential to occur. Observed within Dixie Meadows during 2009 surveys and 2013 surveys.
Mallard <i>Anas platyrhynchos</i>	Primarily shallow waters.	Potential to occur. Observed within Dixie Meadows during 2009 surveys and 2013 surveys.
Canada goose <i>Branta canadensis</i>	Various habitats near water.	Observed on NAS Fallon lands in the Dixie Valley
Mourning dove <i>Zenaida macroura</i>	Found in a variety of habitats except playas.	Observed within Project Area and within one mile of Project Area within Dixie Meadows during surveys.

Sources: EMPSi 2016, WRC 2013; GBBO 2010; NatureServe 2015; USFWS 2004

3.5.2 Environmental Consequences**Proposed Action (Northern Gen-tie Route)**

Implementation of the Proposed Action would result in direct loss of approximately 1,982 acres of habitat for migratory birds due to construction of the project components shown in **Table 4**. Of these 1,982 acres, approximately 1,860 acres of habitat would be reclaimed following construction, and 122 acres would not be reclaimed. Migratory birds could be displaced from areas of permanent habitat loss; however, the 122 acres of lost habitat would be small relative to the hundreds of thousands of acres of habitat available in Dixie Valley (see **Section 3.6**, Vegetation). Population viability for any one species would not be expected to be in jeopardy because of the habitat loss resulting from implementation of the Proposed Action.

The proposed wells would disturb up to 36 acres of Inter-Mountain Basins Mixed Salt Desert Scrub vegetation, and up to 14 acres of Inter-Mountain Basins Greasewood Flat vegetation that would not be reclaimed following construction (Ormat GIS 2016; SWReGAP GIS 2005). The proposed power plant(s) would disturb up to 32 acres of Inter-Mountain Basins Mixed Salt Desert Scrub and Inter-Mountain Basins Greasewood Flat vegetation that would not be reclaimed following construction (Ormat GIS 2016; SWReGAP GIS 2005). However, final plant(s) locations and, thus, the exact amount of disturbance in each vegetation type are not known at this time. Well and power plant(s) access roads and pipelines would also disturb these vegetation types. However, the final locations and, thus, the exact amount of disturbance in each vegetation type are not known at this time.

The proposed gen-tie would cross seven vegetation types, as follows: 26.3 miles (55 percent) would cross Inter-Mountain Basins Mixed Salt Desert Scrub; 12.6 miles (26 percent) would cross Inter-Mountain Basins Greasewood Flat; 3.5 miles (7 percent) would cross Inter-Mountain Basins Big Sagebrush Shrubland; 3.2 miles (7 percent) would cross Invasive Annual Grassland; 1.3 miles (3 percent) would cross Invasive Annual and Biennial Forbland; 0.7 mile (1 percent) would cross Inter-Mountain Basins Playa; and 0.5 miles (less than 1 percent) would cross North American Arid West Emergent Marsh (Ormat GIS 2016; SWReGAP GIS 2005).

Environmental protection measures under the Proposed Action include reclaiming disturbed areas (approximately 1,860 acres) to promote the reestablishment of native plant and wildlife habitat. A Reclamation Plan describing interim and final reclamation would be developed and implemented.

A BBCS (see **Appendix C**) was developed. Its purposes are to reduce the potential of injury or mortality to migratory birds from project construction and operation, to ensure adequate monitoring is in place to determine if mortalities are occurring, and to provide a mechanism to implement adaptive management as needed to reduce injury or mortality.

Construction activities under the Proposed Action could result in direct mortality to migratory birds. Activities, including site preparation, vegetation clearing, and grading, could injure or kill birds or destroy nests, eggs, or young, particularly those species that nest in shrubs or on the ground. To avoid direct mortality, preconstruction avian surveys would be conducted if construction activities must occur during the nesting season as described in Section 5.1 of the BBCS.

Mortality may also occur from bird strike during drilling operations when drill rigs up to 50 feet tall may be used. Bird strike may be particularly pronounced for night-migrating species, which may become disoriented by night-time lights on tall structures (Rich and Longcore 2006). To reduce this potential impact, lights on the drill rig derricks should pulse at the minimum intensity and

minimum number of flashes per minute allowable by Federal Aviation Administration or other applicable regulations, as outlined in Section 5.1 of the BBCS.

Ponds, tanks, and impoundments (including but not limited to drill reserve pits) containing liquids can present hazards to migratory birds (BLM 2008c). Migratory bird access to any liquids contaminated by substances that may be harmful due to toxicity, fouling of the feathers (detergents and oils), or excessive temperatures would be excluded by wildlife-proof fencing, netting, or other covering at all times when not in active use. This measure would conform to Appendix D, Best Management Practices – Mitigation Measures, of the BLM's 2008 geothermal leasing PEIS (see **Appendix F**).

Indirect, temporary effects from noise, human presence, and heavy equipment present during construction activities may lead to displacement from suitable habitat. This may lead to reduced breeding and/or nesting success for individuals within or near the project footprint. This in turn may affect foraging opportunities for species that prey on adult birds, nestlings, or eggs. Raptor species that prey on small mammals, rodents, and lizards may avoid foraging within or adjacent to the project footprint during construction activities and could therefore be temporarily affected.

The noise from drilling wells and the construction of a geothermal power plant would have a different effect on nearby birds than the noise from operation of a geothermal power plant. This is because the noise generated during drilling and construction are louder than the noise generated during plant operation. This noise may temporarily displace birds during drilling or construction activities. On the other hand, the consistent and lower decibel background noise emitted from a power plant inhibits birds' ability to hear sounds and communicate to each other. This explains why pairing success and nest density is significantly reduced in the presence of consistent anthropogenic noise (Barber et al. 2009). Therefore, temporary and/or permanent habitat loss may be greater than the actual project footprint.

Operation noise would be minimized by designing the plant to take advantage of noise-reducing design, including from cooling fans. Vinyl fencing slats surrounding the plants would also reduce operational noise in adjacent bird habitat. BLM regulations mandate that noise at one-half mile—or at the lease boundary if closer—from a major geothermal operation shall not exceed 65 A-weighted decibels (43 CFR, Subpart 3200.4[b]).

Operation of the gen-tie line could result in direct mortality from bird strikes and electrocution. This is particularly true for larger bird species and raptors. Due to potential for electrocution, collision, and nesting or perching by migratory birds on overhead power lines, the APLIC guidelines (2006; 2012) would be implemented to reduce this risk through facility design and would

comply with the MBTA and other federal wildlife laws. These measures are discussed in detail in Section 5.1 of the BBCS.

The proposed action for the gen-tie line would pass through the northern portion of Dixie Meadows. Approximately 6,200 linear feet of the gen-tie crosses North American Arid West Emergent Marsh and Inter-Mountain Basins Playa, wetland areas as delineated in 2007 on US Navy lands, and wetlands on BLM-administered lands from the USFWS National Wetland Inventory (Ormat GIS 2016; SWReGAP GIS 2005; Navy GIS 2016; NWI GIS 2016). Construction of the gen-tie could cause changes in hydrology and functioning of the wetland and playa habitats that are critical for breeding and migration of migratory birds. Therefore, the impacts described above would be higher in the Dixie Meadows area, compared with other portions of the gen-tie alignment.

Due to implementation of the BBCS, the temporary nature of drilling- and construction-related noise, the minimal extent of operational noise effects from the power plants, and the amount of habitat disturbance that would not be reclaimed (122 acres) relative to the hundreds of thousands of acres of available habitat around the Project Area, population viability for any one migratory bird species is not expected to be in jeopardy as a result of implementing the Proposed Action. Migratory birds nesting surveys required prior to ground disturbance during the nesting season would prevent most direct impacts on migratory bird species. The impacts resulting from construction-related mortality (vehicle strike), construction noise, human presence, and presence of heavy equipment would be expected to be temporary and short term for the duration of the proposed construction and drilling activities. Impacts resulting from bird strike or electrocution due to the gen-tie line would be avoided by implementing APLIC (2006 and 2012) guidelines. Therefore, impacts are not expected to jeopardize the viability of migratory bird populations. The Proposed Action would be in compliance with the MBTA and BGEPA.

Alternative 1 (Southern Gen-tie Route)

The nature and type of impacts on migratory birds under Alternative 1 would be similar to those described under the Proposed Action. However, Alternative 1 would result in 10 fewer acres of habitat loss for migratory birds.

Implementation of Alternative 1 would result in approximately 1,354 acres of habitat disturbance for migratory birds; of these 1,354 acres, 1,242 acres would be reclaimed following construction, and 112 acres would not as summarized in **Table 7**.

The amount of vegetation type disturbance from wells, power plant(s), and access roads and pipelines would be the same as described under the Proposed Action.

The gen-tie under Alternative 1 would cross four vegetation types, as follows: 22.7 miles (73 percent) would cross Inter-Mountain Basins Mixed Salt Desert

Scrub; 7 miles (22 percent) would cross Inter-Mountain Basins Greasewood Flat; 1.6 miles (5 percent) would cross Invasive Annual and Biennial Forbland; and less than 0.1 miles (less than 1 percent) would cross Inter-Mountain Basins Active and Stabilized Dune (Ormat GIS 2016; SWReGAP GIS 2005).

The southern gen-tie route would not impact the Dixie Meadows area or any other seeps, springs, wetland, or riparian vegetation. Because this alternative does not include gen-tie construction or operation in wetland or riparian areas, direct and indirect impacts on migratory bird habitat during critical nesting and migration periods would likely be substantially reduced, compared with the Proposed Action.

Environmental protection measures and their associated impacts under Alternative I are the same as those described under the Proposed Action. Alternative I would be in compliance with the MBTA and the BGEPA.

No Action Alternative

Under the No Action Alternative, the BLM would not approve the Proposed Action, the facilities would not be constructed, and ORNI 32 would likely suspend exploration activities authorized under the two previous Decision Records for the foreseeable future. As such, there would be no change in existing migratory bird migration, foraging, or nesting conditions at the site.

3.6 VEGETATION

3.6.1 Affected Environment

Table 17, below, presents the Southwest Regional Gap Analysis Project (SWReGAP) landcover types, a summary landcover type description, and associated acreages within the geothermal lease areas and the gen-tie line routes and buffers around the gen-tie line routes. The Biological Survey Report (EMPSi 2016) and the Baseline Wildlife Survey (WRC 2013) include detailed descriptions of each SWReGAP Landcover type within the Project Area.

Coverage areas for both surveys included the proposed geothermal lease sites; but the precise survey boundaries varied slightly between the two surveys. For these reasons, acres of landcover types reported are approximate and cannot simply be added together to give a total of each landcover type in the Project Area. Nevertheless, reported acres represent the relative abundance of each landcover type in the Project Area.

Plant species commonly observed in the Project Area include Indian ricegrass (*Achnatherum hymenoides*), budsage (*Artemisia spinescens*), four-wing saltbush (*A. canescens*), shadscale (*A. confertifolia*), cheatgrass (*Bromus tectorum*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), halogeton (*Halogeton glomeratus*), winterfat (*Krascheninnikovia lanata*), Russian thistle or tumbleweed (*Salsola tragus*), greasewood (*Sarcobatus* spp.), and seepweed (*Suaeda nigra*; ESRS 2013).

Table 17
SWReGAP Landcover Types

SWReGAP Landcover Type	Landcover Description	Approximate Acres		
		Northern Gen-Tie Line ¹	Southern Gen-Tie Line ²	Geothermal Lease Areas
Inter-Mountain Basins Mixed Salt Desert Scrub	Open-canopied shrublands of typically saline basins, alluvial slopes, and plains; substrates are often saline and calcareous, medium- to fine-textured, alkaline soils; vegetation characterized as typically open to moderately dense shrubland composed of one or more saltbush (<i>Atriplex</i>) species; herbaceous layer varies from sparse to moderately dense.	638	2,545	283
Inter-Mountain Basins Greasewood Flat	Typically occurs near drainages on stream terraces and flats or may form rings around more sparsely vegetated playas; typically have saline soils, a shallow water table and flood intermittently, but remain dry for most growing seasons; usually occurs as a mosaic of multiple communities, with open to moderately dense shrublands dominated or co-dominated by greasewood (<i>Sarcobatus</i> spp.); often surrounded by mixed salt desert scrub.	305	477	247
Invasive Shrubland, Forbland, or Grassland	Areas dominated by introduced shrubs and/or annual, biennial, and/or perennial forbs and grasses.	110	198	0
Inter-Mountain Basins Big Sagebrush Shrubland	Occurs in broad basins between mountain ranges, plains, and foothills. Soils are typically deep, well-drained, and non-saline. These shrublands are dominated by big sagebrush (<i>Artemisia tridentata</i> ssp. <i>tridentata</i> or <i>A. t.</i> ssp. <i>wyomingensis</i>). Perennial herbaceous components usually contribute less than 25% vegetative cover.	83	0	0
North American Arid West Emergent Marsh	Frequently or continually inundated, with water depths up to 2 meters. Water levels may be stable or may fluctuate one meter or more over the course of the growing season. Vegetation is characterized by herbaceous plants that are adapted	12	0	5

Table 17
SWReGAP Landcover Types

SWReGAP Landcover Type	Landcover Description	Approximate Acres		
		Northern Gen-Tie Line ¹	Southern Gen-Tie Line ²	Geothermal Lease Areas
	to saturate soil conditions, such as rushes (<i>Juncus</i> spp.) and cattails (<i>Typha</i> spp.)			
Inter-Mountain Basins Playa	Composed of barren and sparsely vegetated playas (generally less than 10 percent plant cover); salt crusts are common, with small saltgrass (<i>Distichlis</i> sp.) beds in depressions and sparse shrubs around the margins; intermittently flooded.	18	8	0
Inter-Mountain Basins Active and Stabilized Dune	Often composed of a mosaic of migrating, bare dunes; anchored dunes with sparse to moderately dense vegetation (less than 10 to 30 percent canopy cover); and stabilized dunes.	0	3	0

Source: EMPSi 2016; WRC 2013; USGS 2005; SWReGAP GIS 2005

¹ Acreage calculated within a 100-foot buffer of the proposed northern gen-tie line route

² Acreage calculated within a 200- to 500-foot buffer from the southern gen-tie line route

3.6.2 Environmental Consequences

Proposed Action (Northern Gen-tie Route)

Implementation of the Proposed Action would result in disturbance of approximately 1,982 acres of vegetation due to construction of the project components shown in **Table 4**. Of these 1,982 acres, 1,860 acres would be reclaimed following construction, and approximately 122 acres would not.

Proposed wells would disturb up to 36 acres of Inter-Mountain Basins Mixed Salt Desert Scrub vegetation, and up to 14 acres of Inter-Mountain Basins Greasewood Flat vegetation that would not be reclaimed following construction (Ormat GIS 2016; SWReGAP GIS 2005). The proposed power plant(s) would disturb up to 32 acres of Inter-Mountain Basins Mixed Salt Desert Scrub and Inter-Mountain Basins Greasewood Flat vegetation that would not be reclaimed following construction (Ormat GIS 2016; SWReGAP GIS 2005). However, final plant(s) locations and, thus, the exact amount of disturbance in each vegetation type are not known at this time. Well and power plant(s) access roads and pipelines would also disturb these vegetation types. However, the final locations and, thus, the exact amount of disturbance in each vegetation type are not known at this time.

The proposed gen-tie would cross seven vegetation types, as follows: 26.3 miles (55 percent) would cross Inter-Mountain Basins Mixed Salt Desert Scrub; 12.6

miles (26 percent) would cross Inter-Mountain Basins Greasewood Flat; 3.5 miles (7 percent) would cross Inter-Mountain Basins Big Sagebrush Shrubland; 3.2 miles (7 percent) would cross Invasive Annual Grassland; 1.3 miles (3 percent) would cross Invasive Annual and Biennial Forbland; 0.7 miles (1 percent) would cross Inter-Mountain Basins Playa; and 0.5 miles (less than 1 percent) would cross North American Arid West Emergent Marsh (Ormat GIS 2016; SWReGAP GIS 2005).

The gen-tie line is proposed to pass through the northern portion of Dixie Meadows. Approximately 0.5 miles (2,500 linear feet) of the gen-tie crosses North American Arid West Emergent Marsh vegetation (Ormat GIS 2016; SWReGAP GIS 2005). Direct and indirect impacts on this vegetation type would be of higher consequence due to its limited extent in the Project Area. Impacts would be avoided, minimized, or mitigated by implementing minimization and mitigation measures proposed for water resources (see **Section 3.3.2**) and wetlands and riparian vegetation (see **Section 3.9.2**). Environmental protection measures under the Proposed Action include reclaiming temporarily disturbed areas to promote the reestablishment of native vegetation. A Reclamation Plan describing interim and final reclamation would be developed and implemented.

Indirect impacts on vegetation would include potential for increased weed establishment and spread from soil disturbance during construction. Environmental protection measures outlined in **Section 2.1.6** would reduce potential for weed establishment and spread, including preparing an invasive plant management plan prior to construction, reporting noxious weeds to the BLM, and using weed-free seed in reclamation activities.

Indirect effects could also result from fugitive dust generated during construction that settles on vegetation, reducing productivity. Environmental protection measures include dust control measures during construction to minimize this effect.

Alternative 1 (Southern Gen-tie Route)

The nature and type of impacts on vegetation under Alternative 1 would be similar to those described under the Proposed Action. However, Alternative 1 would result in approximately 10 fewer acres of vegetation disturbance.

Implementation of Alternative 1 would result in disturbance of approximately 1,354 acres of vegetation; of these 1,354 acres, 1,242 acres would be reclaimed following construction, and 112 acres would not as summarized in **Table 7**.

The amount of vegetation type disturbance from wells, power plant(s), and access roads and pipelines would be the same as described under the Proposed Action.

The gen-tie under Alternative 1 would cross four vegetation types, as follows: 22.7 miles (73 percent) would cross Inter-Mountain Basins Mixed Salt Desert Scrub; 7 miles (22 percent) would cross Inter-Mountain Basins Greasewood

Flat; 1.6 miles (5 percent) would cross Invasive Annual and Biennial Forbland; and less than 0.1 miles (less than 1 percent) would cross Inter-Mountain Basins Active and Stabilized Dune (Ormat GIS 2016; SWReGAP GIS 2005).

The southern gen-tie line does not traverse Dixie Meadows or North American arid west emergent marsh vegetation. Direct and indirect impacts on this vegetation type from construction and maintenance of the southern gen-tie line are not anticipated.

Environmental protection measures and their associated impacts under Alternative I are the same as those described under the Proposed Action.

No Action Alternative

Under the No Action Alternative, the BLM would not approve the project, the facilities would not be constructed, and ORNI 32 would likely suspend exploration activities authorized under the two previous Decision Records for the foreseeable future. As such, there would be no change in existing vegetation conditions at the site.

3.7 WILDLIFE AND KEY HABITAT

3.7.1 Affected Environment

Table 18, below, presents the habitat types (based on SWReGAP landcover types presented in **Section 3.6**, Vegetation) within the Project Area and typical associated wildlife species within the Great Basin. Species documented during surveys were typical for the habitat types observed. A total of 33 bird, 11 mammal, and 5 reptile species were directly observed or detected by sign (e.g., tracks, burrows, or scat) within the Project Area or within 1 mile of the Project Area during surveys (EMPSi 2016). A total of 28 bird, 9 mammal, 7 reptile, and 1 amphibian species were directly observed or detected by sign (e.g., tracks, burrows, or scat) in the project survey area and 1-mile buffer during the 2013 surveys, and 17 of the bird species were only recorded at Dixie Meadows (WRC 2013). A complete list of wildlife species observed during the field surveys is included in the biological survey reports (EMPSi 2016; WRC 2013) in **Appendix D**, Biological Survey Reports.

Table 18
Typical Wildlife Species Associated with Habitats in the Project Area

Habitat Type¹	Associated Species
Inter-Mountain Basins Mixed Salt Desert Scrub	Pronghorn antelope (<i>Antilocapra americana</i>); coyote (<i>Canis latrans</i>); Great Basin pocket mouse (<i>Perognathus parvus</i>); common raven (<i>Corvus corax</i>); side-blotched lizard (<i>Uta stansburiana</i>)
Inter-Mountain Basins Greasewood Flat	Black-tailed jackrabbit (<i>Lepus californicus</i>); white-tailed antelope squirrel (<i>Ammospermophilus leucurus</i>); black-throated sparrow; horned lark; desert horned lizard (<i>Phrynosoma platyrhinos</i>)
Invasive Shrubland, Forbland, or Grassland	Common raven; red-tailed hawk; horned lark; pronghorn antelope; collared lizard (<i>Crotaphytus bicinctores</i>)

Table 18
Typical Wildlife Species Associated with Habitats in the Project Area

Habitat Type¹	Associated Species
Inter-Mountain Basins Big Sagebrush Shrubland	Sage sparrow; Great Basin fence lizard (<i>Sceloporus occidentalis longipes</i>); western kingbird (<i>Tyrannus verticalis</i>)
Inter-Mountain Basins Active and Stabilized Dunes	Dune invertebrates including beetles, solitary bees, crickets, ants, kangaroo rats (<i>Dipodomys deserti</i>)
North American Arid West Emergent Marsh	Yellow-headed blackbird (<i>Xanthocephalus xanthocephalus</i>); marsh wren (<i>Cistothorus palustris</i>); spotted sandpiper (<i>Actitis macularius</i>); bullfrog (<i>Rana catesbeiana</i>)
Inter-Mountain Basins Playa	Pocket gopher (<i>Thomomys bottae</i>); killdeer (<i>Charadrius vociferus</i>); American avocet; black-necked stilt (<i>Himantopus mexicanus</i>)

Source: EMPSi 2016; NDOW 2012

¹ Based on SWReGAP landcover types

Based on the SWReGAP (2005), the Nevada Department of Wildlife's Wildlife Action Plan (2012) characterized Nevada's vegetative land cover into broad ecological system groups and linked those with 22 key habitat types. Along with survey data, key habitats can be used to infer likely occurrences of wildlife species assemblages. Key habitat types within the Project Area include:

- Cold Desert Scrub (corresponding to SWReGAP Inter-Mountain Basins Mixed Salt Desert Scrub and Inter-Mountain Basins Greasewood Flat)
- Sagebrush (corresponding to SWReGAP Inter-Mountain Basins Big Sagebrush Shrubland)
- Desert Playas and Ephemeral Pools (corresponding to SWReGAP Inter-Mountain Basins Playa)
- Marshes (corresponding to SWReGAP North American Arid West Emergent Marsh)
- Sand Dunes and Badlands (corresponding to SWReGAP Inter-Mountain Basins Active and Stabilized Dunes)

Cold Desert Scrub is an important habitat in Nevada for several sensitive species. Soils of this habitat tend to be loose and either sandy or gravelly and are often easy to dig. Blow sand tends to accumulate around the shrubby bases of the saltbushes, particularly shadscale (*Atriplex confertifolia*). This creates hummocks of soil that lend themselves to burrowing and denning. Cold Desert Scrub serves as an important support habitat for several avian sagebrush breeders, including sage sparrow.

In Nevada, species predominantly dependent on sagebrush habitat for most of their life history needs include Great Basin pocket mouse, sagebrush vole (*Lemmiscus curtatus*), sagebrush lizard (*Sceloporus graciosus*), and sage sparrow.

Sagebrush range in good condition also supports a lush undergrowth of bunchgrasses and forbs. The presence of this highly productive understory is critical to the needs of other wildlife species, including the sagebrush vole. The various shrew (*Sorex* spp.) species that live in sagebrush are insectivores, but they depend on the productivity of the herbaceous component for the abundant production of their prey items, as well as for cover.

When playas contain water for extended periods of time, lush vegetation can grow in addition to producing many aquatic invertebrates that provide forage for shorebirds, waterfowl, and small water birds. Several permanent water sources drain onto the playa area near the possible power plant locations. The volume of water discharged from these sources does not provide for complete inundation of the playa. These water sources and aquatic habitats associated with them support riparian vegetation. They also provide migratory waterfowl habitat. These and other amphibians, like the Great Basin spadefoot toad (*Spea intermontana*), have been observed in the southern portion of the Dixie Valley (NASF 2011).

Seasonal inundation of the playa area, generally during spring when snowmelt runoff is greatest, would provide additional open water habitat for herons, egrets, bitterns, ducks, geese, and other birds associated with open water. Marshes are among Nevada's most diverse and prolific wildlife habitats. The occurrence of marshes on the landscape is critical to both breeding and migratory needs of many species of birds.

Sand dunes and badlands include ecological systems defined by substrate characteristics rather than by vegetative cover (e.g., weathered soil patches and aeolian deposits). Sand dunes and badlands often define unique habitats and support endemic plants and animals, as well as provide habitat for generalist species. Many sand dune systems in Nevada have a high diversity of dune invertebrates, including beetles, solitary bees, crickets, and ants, some of which are sand dune obligates (Nachlinger et al. 2001). Annual seed production is positively correlated with rainfall in sand dune habitats, and as a result, the diversity of seed-eating rodents and perennial shrubs in these habitats is directly tied to annual rainfall. Desert kangaroo rats primarily feed on seeds in sand dune habitats. Sand dune species may burrow in the sand to rest, forage, and build nests. Prey-seeking species are drawn to sand dune habitats to feed on small mammals, lizards, and other inhabitants.

Big Game

The BLM manages habitat for game species. The Stillwater Range in the vicinity of the Project Area is year-round mule deer (*Odocoileus hemionus*) and pronghorn antelope range, and potential elk (*Cervus canadensis nelsoni*) habitat (BLM 2015b). Multiple big and small game guzzlers are located to the east and south of the project.

EMPSi coordinated with NDOW before the 2016 field survey. NDOW indicated that there are occupied bighorn sheep and pronghorn antelope distributions in portions of the Project Area and within a 4-mile buffer of the Project Area. NDOW also reported occupied year-round, crucial summer, and crucial winter mule deer distribution within the 4-mile buffer area. No occupied elk habitat exists in the vicinity of the Project Area. No mule deer were observed in the Project Area; however, an old three-point shed was found within the 1-mile survey buffer from the southern gen-tie line route (WRC 2013).

Pronghorn antelope was the only big game species that was observed within the Project Area during field surveys. Antelope was observed in both Dixie Valley and Jersey Valley during the 2011 and 2016 surveys (EMPSi 2016). A total of three antelopes were observed in Jersey Valley (the next valley north of Dixie Valley) in mixed salt desert scrub and invasive grassland habitats in 2011. In 2016, a small herd of antelope, including several juveniles, was observed foraging on irrigated alfalfa in Dixie Valley. A few additional antelopes were observed in mixed salt desert scrub. Antelope scat and tracks were also noted throughout the Project Area.

Other Wildlife

An active kit fox (*Vulpes macrotis*) burrow complex was recorded in the northern gen-tie line buffer area in the northern Dixie Valley. No kit foxes were observed, but recent jackrabbit prey remains and scat were present at the burrow complex location.

3.7.2 Environmental Consequences

Proposed Action (Northern Gen-tie Route)

Implementation of the Proposed Action would result in disturbance of approximately 1,982 acres of wildlife habitat, consisting primarily of cold desert scrub, due to construction of the project components shown in **Table 4**. Of these 1,982 acres, approximately 1,860 acres would be reclaimed following construction, and 122 acres would not. The 122 acres of lost habitat would be small relative to the abundant cold desert scrub habitat available in the Dixie Valley.

Proposed wells would disturb up to 36 acres of Inter-Mountain Basins Mixed Salt Desert Scrub habitat, and up to 14 acres of Inter-Mountain Basins Greaswood Flat habitat that would not be reclaimed following construction (Ormat GIS 2016; SWReGAP GIS 2005). The proposed power plant(s) would disturb up to 32 acres of Inter-Mountain Basins Mixed Salt Desert Scrub and Inter-Mountain Basins Greaswood Flat habitat that would not be reclaimed following construction (Ormat GIS 2016; SWReGAP GIS 2005). However, final plant(s) locations and, thus, the exact amount of disturbance in each habitat type are not known at this time. Well and power plant(s) access roads and pipelines

would also disturb these habitats. However, the final locations and, thus, the exact amount of disturbance in each habitat type are not known at this time.

The proposed gen-tie would cross seven key habitat types, as follows: 26.3 miles (55 percent) would cross Inter-Mountain Basins Mixed Salt Desert Scrub; 12.6 miles (26 percent) would cross Inter-Mountain Basins Greasewood Flat; 3.5 miles (7 percent) would cross Inter-Mountain Basins Big Sagebrush Shrubland; 3.2 miles (7 percent) would cross Invasive Annual Grassland; 1.3 miles (3 percent) would cross Invasive Annual and Biennial Forbland; 0.7 miles (1 percent) would cross Inter-Mountain Basins Playa; and 0.5 miles (less than 1 percent) would cross North American Arid West Emergent Marsh (Ormat GIS 2016; SWReGAP GIS 2005).

Environmental protection measures under the Proposed Action (**Section 2.1.6**) include reclaiming temporarily disturbed areas to promote the reestablishment of native plant and wildlife habitat. A Reclamation Plan describing interim and final reclamation would be developed and implemented. An invasive plant management plan would be developed and implemented prior to construction, which would ensure that there is no net increase in the amount of weeds on-site during the life of the project.

Generally, construction under the Proposed Action would have similar nature and type of impacts on wildlife as described under **Section 3.5**, Migratory Birds. Additional impacts are described below.

Surface disturbance under the Proposed Action could result in potential mortality from vehicle collisions and destruction of underground burrows for reptiles and small mammals that forage and/or have burrow complexes within the work areas. This habitat loss and disturbance may lead to reduced breeding success for individuals that are displaced into surrounding areas as well as those affected by the fragmentation of the overall footprint of the project. This, in turn, may affect distribution of large mammals, such as big game, and raptors that forage on rodents and small mammals. Environmental protection measures described in **Section 2.1.6**, including reclamation of temporarily disturbed areas, would minimize permanent habitat loss. Speed limits for construction and operational traffic would minimize potential mortality from vehicle strike. Limiting vehicle and equipment travel to established roads and roads that are part of the Proposed Action would reduce the potential for burrow damage.

Larger species, such as big game, may be impacted by habitat fragmentation or construction noise caused by project development. These impacts are expected to be minimal and would affect individuals and local groups of animals using or migrating through the area.

Indirect, temporary effects on wildlife from the construction typically come from increased noise, human presence, and heavy equipment present during construction activities. These brief, loud noises are more likely to be perceived

as predatory sounds, which may elicit an artificial “fight or flight” response. The presence of construction workers, equipment, and noise could cause animals to avoid the area during construction activities.

Indirect impacts on wildlife and habitat would include potential for increased weed establishment and spread from soil disturbance during construction. Weed spread may alter habitat conditions, resulting in less suitable habitat for wildlife species. Environmental protection measures outlined in **Section 2.1.6** would reduce potential for weed establishment and spread, including preparing an invasive plant management plan prior to construction, reporting noxious weeds to the BLM, and using weed-free seed in reclamation activities. As a result, the Proposed Action would have no net increase in the amount of weeds onsite during the life of the project.

Indirect effects could also result from fugitive dust generated during construction that settles on vegetation, reducing productivity and degrading wildlife habitat. Environmental protection measures outlined in **Section 2.1.6** include dust control measures during construction to minimize this effect.

The proposed action for the gen-tie line would pass through the northern portion of Dixie Meadows. Approximately 6,200 linear feet of the gen-tie crosses North American Arid West Emergent Marsh and Inter-Mountain Basins Playa, wetland areas as delineated in 2007 on US Navy lands, and wetlands on BLM-administered lands from the USFWS National Wetland Inventory (Ormat GIS 2016; SWReGAP GIS 2005; Navy GIS 2016; NWI GIS 2016). The wetlands and riparian vegetation and open waters associated with seeps and springs and seasonal ponds in this area provide critical habitat for wildlife species. The number and diversity of terrestrial and aquatic species that use this area are likely elevated, compared with other portions of the gen-tie alignment. Construction of the gen-tie would cause changes in hydrology and functioning of the wetland or playa habitat that are critical for wildlife. Therefore, the impacts described above would be higher in the Dixie Meadows area, compared with other portions of the gen-tie alignment.

Compared with construction, operation would result in fewer impacts on wildlife. During operation there would be no additional habitat loss, a lower probability for mortality from collision with vehicles, less loud noises, and fewer humans at the proposed project site.

The quieter and more consistent background noise associated with power plant operation could affect animals’ ability to perceive sounds. This would affect different species differently, depending on how they use sound and the frequency of these sounds. Rodents that use chirps to warn of predators may be susceptible to increased predation, because these chirps may be masked from the power plant noise (Barber et al. 2009). This, in turn, may affect the distribution of predators. In effect, noise may create a larger area of habitat disturbance than the project footprint alone.

Operation noise would be minimized by designing the plants to take advantage of noise-reducing design, including from cooling fans, as described in **Section 2.1.3**. Vinyl fencing slats surrounding the plants would also reduce operational noise in adjacent habitat. BLM regulations mandate that noise at one-half mile—or at the lease boundary if closer—from a major geothermal operation shall not exceed 65 A-weighted decibels (43 CFR, Subpart 3200.4[b]).

Ponds, tanks, and impoundments (including but not limited to drill reserve pits) containing liquids can present hazards to wildlife (BLM 2008c). Wildlife access to any liquids contaminated by substances that may be harmful due to toxicity, fouling of the fur (detergents and oils), or excessive temperatures would be excluded by wildlife proof-fencing, netting, or other covering at all times when not in active use. Clean water impoundments can also present a trapping hazard if they are steep-sided or lined with smooth material. To avoid impacts, any pits that present a wildlife trapping hazard would be fitted or constructed with an escape ramp. These measures would conform to Appendix D, Best Management Practices – Mitigation Measures, of the BLM’s 2008 geothermal leasing PEIS (see **Appendix F** of this EA) and NDOW’s Geothermal Sump Guidelines (NDOW, no date).

Implementing the Proposed Action is not expected to have significant impacts on wildlife species or populations. This would be due to the minimal extent of operational noise effects and the amount of habitat that would not be reclaimed (122 acres), relative to the hundreds of thousands of acres of available habitat around the Project Area. Impacts from dust, noise, human presence, and the presence of heavy equipment would be temporary and short term for the duration of the construction and drilling activities. Operational impacts are expected to be minor.

Alternative 1 (Southern Gen-tie Route)

The nature and type of impacts on wildlife and key habitats under Alternative 1 would be similar to those described under the Proposed Action. However, Alternative 1 would result in approximately 10 fewer acres of habitat loss for wildlife as summarized in **Table 7**. Regardless of the gen-tie line routing option chosen under Alternative 1, impacts on wildlife and key habitats species from either routing option would be the same.

Implementation of Alternative 1 would result in disturbance of approximately 1,354 acres of wildlife habitat. Of these 1,354 acres, 1,242 acres would be reclaimed following construction, and 112 acres would not.

The amount of key habitat disturbance from wells, power plant(s), and access roads and pipelines would be the same as described under the Proposed Action.

The gen-tie under Alternative 1 would cross four key habitat types, as follows: 22.7 miles (73 percent) would cross Inter-Mountain Basins Mixed Salt Desert Scrub; 7 miles (22 percent) would cross Inter-Mountain Basins Greasewood

Flat; 1.6 miles (5 percent) would cross Invasive Annual and Biennial Forbland; and less than 0.1 miles (less than 1 percent) would cross Inter-Mountain Basins Active and Stabilized Dune (Ormat GIS 2016; SWReGAP GIS 2005).

The southern gen-tie route would not impact the Dixie Meadows or any other seeps, springs, wetland, or riparian vegetation. Because this alternative does not include gen-tie construction or operation in wetland or riparian areas, direct and indirect impacts on wildlife habitat during critical breeding and migration periods would likely be substantially reduced, compared with the Proposed Action.

Environmental protection measures described in **Section 2.1.6** and their associated impacts under Alternative I are the same as those described under the Proposed Action.

No Action Alternative

Under the No Action Alternative, the BLM would not approve the project, the facilities would not be constructed, and ORNI 32 would likely suspend exploration activities authorized under the two previous Decision Records for the foreseeable future. As such, there would be no change in existing wildlife habitat or vegetation conditions at the site.

3.8 BLM SENSITIVE SPECIES

BLM sensitive species are defined in BLM Manual 6840 (Special Status Species Management) as native species found on BLM-administered lands for which the BLM has the capability to significantly affect the conservation status of the species through management and either one of the following:

1. There is information that a species has recently undergone, is undergoing, or is predicted to undergo a downward trend such that the viability of the species or a distinct population segment of the species is at risk across all or a significant portion of the species range; or
2. The species depends on ecological refugia or specialized or unique habitats on BLM-administered lands, and there is evidence that such areas are threatened with alteration such that the continued viability of the species in that area would be at risk (BLM 2008e).

The objectives of the BLM sensitive species policy are twofold, as follows:

1. To conserve or recover species listed under the Endangered Species Act of 1973 (ESA; 16 USC, Section 1531 et seq.), as amended, and the ecosystems on which they depend so that ESA protections are no longer needed for these species

2. To initiate proactive conservation measures that reduce or eliminate threats to BLM sensitive species to minimize the likelihood of and need for listing of these species under the ESA

Greater sage-grouse (*Centrocercus urophasianus*) was a former candidate for listing under the ESA. However, on September 21, 2015, the ROD and Approved Resource Management Plan Amendments for the Great Basin Sub-Region (BLM 2015a) were signed by the Director of the BLM and the Assistant Secretary of Land and Minerals Management. A determination was made by the USFWS that the greater sage-grouse does not warrant protection under the ESA. However, as the BLM considers the greater sage-grouse a sensitive species, it is protected under the BLM's Decision as a special status species. Greater sage-grouse is discussed further below.

The Bald and Golden Eagle Protection Act (1940 as amended 1959, 1962, 1972, 1978; BGEPA) prohibits the take or possession of bald and golden eagles with limited exceptions. Take, as defined in the BGEPA, includes "to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." Disturb means "to agitate or bother a bald or golden eagle to a degree that causes or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding or sheltering behavior."

Important eagle-use area is defined in the BGEPA as an eagle nest, foraging area, or communal roost site that eagles rely on for breeding, sheltering, or feeding, and the landscape features surrounding such nest, foraging area, or roost site are essential for the continued viability of the site for breeding, feeding, or sheltering eagles. The BLM requires consideration and NEPA analysis of golden eagles and their habitat for all renewable energy projects (BLM Instruction Memorandum No. 2010-156).

3.8.1 Affected Environment

A list of sensitive species associated with BLM-administered lands in Nevada was published in 2011 (BLM 2011b). Field surveys for sensitive species, of the geothermal lease areas and the northern gen-tie line route were conducted in 2011 and 2016 (EMPSi 2016). Surveys of the geothermal lease areas and the southern gen-tie route were conducted in 2013 (WRC 2013; ESRS 2013). BLM sensitive plant and wildlife species observed during the surveys, or previously documented within or near the Project Area, or with potential to occur in the Project Area are included in **Table 19**.

Table 19
BLM Sensitive Species
Observed or Potentially Occurring in the Project Area

Species	Habitat	Potential for Occurrence
Plants		
Sodaville milkvetch <i>A. lentiginosus</i> var. <i>sesquimetralis</i>	Moist, open, alkaline hummocks and drainages near cool springs	Potential habitat present; not observed during surveys
Tonopah milkvetch <i>A. pseudiodanthus</i>	Deep loose sandy soils of stabilized and active dune margins, old beaches, valley floors, or drainages, in salt desert shrub	Potential habitat present; not observed during surveys
Sand cholla <i>Grusonia pulchella</i>	Sand of dunes, dry-lake borders, river bottoms, washes, valleys, and plains on sandy soils	One observed in mixed salt desert scrub habitat along northern gen-tie alignment.
Sagebrush pygmyleaf <i>Leoflingia squarrosa</i> ssp. <i>aretemisiarum</i>	Fine, deep, often granitic, sandy soils of valley flats and dunes in the sagebrush and possibly mixed-shrub zones, usually in openings among sagebrush	Potential habitat present; not observed during surveys
Tiehm blazingstar <i>Mentzelia tiehmii</i>	White, alkaline, clay badlands and flats	Potential habitat present; not observed during surveys
Oryctes <i>Oryctes nevadensis</i>	Deep, loose sand of stabilized dunes, washes, and valley flats, on various slopes and aspects; appears only in years with optimal rainfall and temperature patterns	Potential habitat present; not observed during surveys
Nevada dune beardtongue <i>Penstemon arenarius</i>	Deep, volcanic, sandy soils; common associates include fourwing saltbush, littleleaf horsebrush, and greasewood	Potential habitat present; not observed during surveys.
Lahontan beardtongue <i>P. palmeri</i> var. <i>macranthus</i>	Along washes, roadsides, and canyon floors, particularly on carbonate-containing substrates, usually where subsurface moisture is available throughout most of the summer	Potential habitat present; not observed during surveys
Playa phacelia <i>P. inundata</i>	Grows in alkali playas and seasonally inundated areas with clay soils	Potential habitat present; not observed during surveys
Invertebrates		
Carson valley wood nymph <i>Cercyonis pegala carsonensis</i>	Wet meadows	Potential to occur
Pallid wood nymph <i>C. oetus pallescens</i>	Alkaline flats	Potential to occur
Dixie Valley pyrg <i>Pyrgulopsis dixensis</i>	Spring habitats in the Dixie Valley	Documented in the Dixie Meadows springs
Carson Valley silverspot <i>Speyeria nokomis carsonensis</i>	Permanent spring-fed meadows, seeps, marshes, and boggy, streamside meadows associated with flowing water; with adequate supply of the larval food plant (bog violet [<i>Viola nephrophylla</i>])	No violet species observed in the study area; suitable habitat may be present in Dixie Meadows

Table 19
BLM Sensitive Species
Observed or Potentially Occurring in the Project Area

Species	Habitat	Potential for Occurrence
Amphibians		
Dixie Valley toad <i>Anaxyrus boreas</i>	Springs, seeps, streams, and similar wet areas. Endemic to Dixie Valley	Documented in the Dixie Meadows springs
Northern leopard frog <i>Rana pipiens</i>	Springs, slow streams, marshes, bogs, ponds, floodplains, reservoirs, and lakes; usually permanent water with rooted aquatic vegetation	Observed in Dixie Meadows springs during 2009 surveys
Birds		
Burrowing owl <i>Athene cunicularia</i>	Treeless areas with low vegetation and burrows	Potential to occur; detected within 1 mile of survey area
Golden eagle <i>Aquila chrysaetos</i>	Variety of open and semi-open landscapes, with sufficient mammalian prey base and cliff sites for nesting	Confirmed; several nests observed in the surrounding mountains
Ferruginous hawk <i>Buteo regalis</i>	Grasslands and semi-desert shrublands; nests in isolated trees, on rock outcrops, or on the ground	Potential to occur
Swainson's hawk <i>B. swainsoni</i>	Usually occurs close to riparian or other wet habitats; forages over agricultural fields, wet meadows, or open shrublands	Potential to occur
Greater sage-grouse <i>Centrocercus urophasianus</i>	Foothills, plains, and mountain slopes where sagebrush is present, often with a mixture of sagebrush and meadows close by	Northern gen-tie alignment traverses approximately 2.65 miles of OHMA; NDOW identified three pending leks in the vicinity of the Project Area: the Fish Creek Basin 2, 5, and 6 leks. The nearest lek is on private land approximately 3.8 miles from the northern gen-tie alignment in Jersey Valley; the other leks are on BLM-administered lands approximately 4.5 and 5 miles from the northern gen-tie alignment in Jersey Valley.
Western snowy plover <i>Charadrius alexandrinus nivosus</i>	Alkali flat, mudflat, or flat beach next to permanent or seasonal surface water	Potential to occur. Observed within Dixie Meadows during 2009 surveys

Table 19
BLM Sensitive Species
Observed or Potentially Occurring in the Project Area

Species	Habitat	Potential for Occurrence
Peregrine falcon <i>F. peregrinus</i>	Nests on ledge or hole on face of rocky cliff or crag; forages over various open habitats	Potential to occur; suitable foraging habitat present; suitable nesting habitat present in adjacent mountain ranges. Staff at NAS Fallon have observed this species in the Dixie Valley Settlement Area.
Bald eagle <i>Haliaeetus leucocephalus</i>	Nests in tall trees near bodies of water that support primary food sources: fish, waterfowl, and seabirds. Wintering areas are commonly associated with open water though in some regions (e.g., Great Basin), some bald eagles use habitats with little or no open water (e.g., montane areas) if upland food resources (e.g. rabbit or deer carrion and livestock afterbirths) are readily available.	No suitable nesting habitat present, potential to winter in the Project Area. No bald eagle nests have been documented within 10 miles of the Project Area (WRC 2013).
Loggerhead shrike <i>Lanius ludovicianus</i>	Open country, with scattered trees and shrubs, desert scrub; nests in shrubs or small trees	Observed along the northern gen-tie route
Sage thrasher <i>Oreoscoptes montanus</i>	Breeds in arid or semiarid sagebrush plains; in winter, uses arid and semiarid scrub, brush, and thickets	Potential to occur
Brewer's sparrow <i>Spizella breweri</i>	Strongly associated with sagebrush, in areas with scattered shrubs and short grass; in migration and winter, uses low, arid vegetation, desert scrub, sagebrush, and creosote bush	Potential to occur
Mammals		
Pallid bat <i>Antrozous pallidus</i>	Arid deserts and grasslands, often near rocky outcrops and water	Maternity and hibernation roost in Jersey Valley, approximately 3,000 feet (0.6 miles) from northern gen-tie route. Potential foraging habitat; documented by NDOW in project vicinity; documented in Dixie Meadows during acoustic surveys

Table 19
BLM Sensitive Species
Observed or Potentially Occurring in the Project Area

Species	Habitat	Potential for Occurrence
Townsend's big-eared bat <i>Corynorhinus townsendii</i>	Maternity and hibernation colonies typically in caves and mine tunnels	Maternity roost in Jersey Valley, approximately 3,000 feet (0.6 miles) from northern gen-tie route. Potential foraging habitat; documented by NDOW in project vicinity
Big brown bat <i>Eptesicus fuscus</i>	Various wooded and semi-open habitats, including in cities	Foraging habitat present
Spotted bat <i>Euderma maculatum</i>	Various habitats, from desert to montane, including canyon bottoms, and open pastures	Foraging habitat present
Silver-haired bat <i>Lasionycteris noctivagans</i>	Prefers forested areas next to lakes, ponds, and streams	Foraging habitat present; documented in Dixie Meadows during acoustic surveys
Western red bat <i>Lasiurus blossevillii</i>	Riparian habitats in forests and woodlands, from lowlands up through mixed conifer forests of mountains; foraging habitat includes grasslands, shrublands, open woodlands and forests, and croplands	Foraging habitat present
Hoary bat <i>L. cinereus</i>	Prefers deciduous and coniferous forests and woodlands	Foraging habitat present; documented in Dixie Meadows during acoustic surveys
Small-footed myotis <i>Myotis ciliolabrum</i>	Desert, badland, and semiarid habitats	Foraging habitat present; documented by NDOW in project vicinity; documented in Dixie Meadows during acoustic surveys
California myotis <i>M. californicus</i>	Western lowlands; canyons, riparian woodlands, desert scrub, and grasslands	Foraging habitat present; documented in Dixie Meadows during acoustic surveys
Long-eared myotis <i>M. evotis</i>	Mostly forested areas; also shrubland, along wooded streams, over reservoirs	Foraging habitat present; documented by NDOW in project vicinity
Little brown myotis <i>M. lucifugus</i>	Adapted to using human-made structures; also uses caves and hollow trees	Foraging habitat present
Fringed myotis <i>M. thysanodes</i>	Desert, grassland, and wooded habitats	Foraging habitat present
Long-legged myotis <i>M. volans</i>	Primarily in montane coniferous forests; also in riparian and desert habitats	Foraging habitat present; documented on US Navy lands near the Dixie Valley Settlement Area

Table 19
BLM Sensitive Species
Observed or Potentially Occurring in the Project Area

Species	Habitat	Potential for Occurrence
Yuma myotis <i>M. yumanensis</i>	Wide variety of upland and lowland habitats, including riparian, desert scrub, moist woodlands, and forests, usually near open water	Foraging habitat present; documented by NDOW in project vicinity; documented in Dixie Meadows during acoustic surveys
Brazilian free-tailed bat <i>Tadarida brasiliensis</i>	Roosts primarily in caves	Foraging habitat present; documented in Dixie Meadows during acoustic surveys
Western pipistrelle bat <i>Pipistrellus hesperus</i>	Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons	Foraging habitat present; documented by NDOW in project vicinity; documented in Dixie Meadows during acoustic surveys
Pygmy rabbit <i>Brachylagus idahoensis</i>	Occurs throughout much of the Great Basin in areas of tall, dense sagebrush (<i>Artemisia</i> spp.) or mixed sagebrush habitats. Pygmy rabbit burrows are typically found in relatively deep, loose soils of wind- or water-born origin suitable for burrowing.	No pygmy rabbits, burrows, scat, or tracks were observed during surveys. No suitable habitat present in the Project Area. Pygmy rabbit has been observed in suitable habitat in the vicinity of the Project Area. ¹
Dark kangaroo mouse <i>Microdipodops megacephalus</i>	In loose sands and gravel; found in shadscale scrub, sagebrush scrub, and alkali sink plant communities	Potential to occur
Pale kangaroo mouse <i>M. pallidus</i>	Restricted to fine sands in alkali sink and desert scrub dominated by shadscale or big sagebrush; often burrows in areas of soft, windblown sand, piled at the bases of shrubs	Potential to occur, especially along southern gen-tie ROW
Desert bighorn sheep <i>Ovis canadensis nelsoni</i>	Steep slopes on or near mountains, with a clear view of surrounding area	Suitable habitat in the Stillwater Range, next to Dixie Valley; no suitable habitat in the Project Area

Sources: EMPSi 2016; NNHP 2016; NDOW 2016

¹ Email from Angelica Rose, BLM, to Drew Vankat, EMPSi, on September 2, 2016, regarding Dixie Meadows Comments

Plants

EMPSi biologists surveyed the Project Area and a 250-foot buffer for sensitive plant species in May 2011; in June 2016, they surveyed additional portions of the Project Area not covered by the 2011 surveys due to gen-tie alignment modifications. A full description of survey method and agency coordination is in the Biological Survey Report (EMPSi 2016; see **Appendix D**).

One BLM sensitive plant species was observed in the survey area in 2016, a sand cholla (*Grusonia pulchella*) growing in mixed salt desert scrub, along the proposed transmission alignment in the northern Dixie Valley (see Figure 4 in EMPSi 2016). Soils at the site are somewhat alkaline sandy silts, with a moderately high biological crust cover, indicating marginal habitat for this species. The plant was not blooming, despite surveys being conducted during the blooming period, as indicated by the NNHP. No withered flowers or fruit were observed on the plant, indicating that it may not have bloomed in 2016.

Additional species that have not been observed in the Project Area vicinity but that have potential to occur in the Project Area based on presence of potentially suitable habitat are discussed below.

Sodaville milkvetch (*Astragalus lentiginosus* var. *sesquimetrallis*) is a perennial herb in the pea family that grows in moist, open, alkaline hummocks and drainages near cool springs with saltgrass, greasewood, and other associated species (NNHP 2001). Potential habitat for this species occurs in the Dixie Meadows.

Tonopah milkvetch (*Astragalus pseudodanthus*) is a perennial herb in the pea family that grows in deep, loose, sandy soils of stabilized and active dune margins, old beaches, valley floors, or drainages, with greasewood and other salt desert shrub species (NNHP 2001). Potential habitat for this species occurs in sandy soils especially along the southern gen-tie route.

Sagebrush pygmyleaf (*Loeflingia squarrosa* ssp. *artemisiarum*) is an annual herb in the pink family that grows in fine, deep, often granitic, sandy soils of valley flats and dunes in the sagebrush and possibly mixed-shrub zones, usually in openings among sagebrush (NNHP 2001). Potential habitat for this species occurs in sagebrush vegetation along the northern gen-tie route.

Tiehm blazingstar (*Mentzelia tiehmii*) is a perennial herb in the Loasaceae family that grows in white, alkaline clay badlands and flats (NNHP 2001). Potential habitat for this species may occur in the foothills of the adjacent ranges.

Oryctes (*Oryctes nevadensis*) is an annual herb in the nightshade family that grows in deep, loose sand of stabilized dunes, washes, and valley flats, on various slopes and aspects (NNHP 2001). Potential habitat for this species occurs in sandy soils especially along the southern gen-tie route.

Nevada dune beardtongue (*Penstemon arenarius*) is a perennial herb in the figwort family that grows in deep, loose, sandy soils of valley bottoms, wind-blown deposits, and dune skirts, often in alkaline areas, sometimes on road banks and other recovering disturbance areas in such soils, in the shadscale zone (NNHP 2001). Potential habitat for this species occurs throughout the Project Area in sandy soils. During the biological survey, potentially suitable habitats for this species were searched on foot; however, this species was not observed.

Lahontan beardtongue (*Penstemon palmeri* var. *macranthus*) is a BLM sensitive species that occurs in washes, along roadsides, and on canyon floors, particularly on carbonate-containing substrates, usually where subsurface moisture is available throughout most of the summer. It has been documented in the vicinity of the Project Area, in Dixie Valley on the lower slopes of the Stillwater Mountains (NNHP 2016). During the biological survey, potentially suitable habitats for this species were searched on foot; however, this species was not observed.

Playa phacelia (*Phacelia inundata*) is an annual herb in the waterleaf family that grows in alkali playas and seasonally inundated areas with clay soils (NNHP 2001). Potential habitat for this species occurs in the Dixie Meadows and on other playa areas in the Dixie Valley.

All cactus species are protected by Nevada statute. At two sites, fragmentary dried remains of Plains beavertail cactus (*Opuntia polyacantha*) were found: one plant site was evidenced by a small pile of long spines; the other was evidenced by a fragment of the distinctive perforated wood that is formed by species in the genus *Opuntia*. Based on the appearance of dead plants of beavertail observed elsewhere, these plants likely died at least 2 years ago and probably much longer (ESRS 2013). No cactus species besides the single sand cholla individual discussed above were observed in the northern gen-tie alignment route.

Invertebrates

Carson Valley Wood Nymph

Carson Valley wood nymph (*Cercyonis pegala carsonensis*) occurs in wet meadows in the Carson Valley; the larval host plant is unknown (WildEarth Guardians 2010). Suitable habitat may occur in the Dixie Meadows; however, this subspecies is not known to occur east of the Carson Valley, so the potential for occurrence in the Project Area is limited.

Pallid Wood Nymph

Pallid wood nymph (*Cercyonis oetus pallescens*) occurs in alkaline flats habitat. It has been documented in Churchill County. Suitable habitat for this species may occur in the Dixie Meadows or other alkaline flats habitat in the Dixie Valley.

Dixie Valley Pyrg

Dixie Valley pyrg (*Pyrgulopsis dixensis*) is a BLM sensitive springsnail that is known to occur in spring habitats only in the Dixie Valley (NNHP 2016). NNHP lists this species as at-risk globally and critically imperiled. It was first collected in 1991 in springs to the west-southwest of the Dixie Hot Springs (Hershler 1998). Very little is known about the life history of Nevada's endemic gastropods; little information on population numbers or the level of existing survey efforts exists for this species. Specific information on the life history of this species is not available, but in general *Pyrgulopsis* snails are short lived, surviving only 1 year, and reproduce only once before death (Frest and Johannes 1995). In general,

these snails are essentially immobile and do not venture far from their place of birth. Springs and seeps comprising potentially suitable habitat for Dixie Valley pyrg is depicted in **Figure 6**, Surface Water.

Species in the genus *Pyrgulopsis* are particularly susceptible to extinction, because the entire population of any single species is often tied to a single spring. Such sites may be no more than a few square meters and easily destroyed by water diversion, capping, groundwater pumping, invasive or exotic species, development, or livestock trampling. Even within an individual spring system the suitable habitat for and distribution of endemic gastropods may be limited to unique, small micro-habitats because of distance from the spring source, thermal and substrate characteristics, velocity, and other factors. Hence, these species may be particularly sensitive to disturbance and site alteration even when they include only a small part of a spring system (Wildlife Action Plan Team 2012).

Additional BLM Sensitive invertebrate species could potentially occur within the Project Area based on literature reviews and habitat assessment. Little published literature is available regarding the ecology of some of these species, which makes the likelihood of occurrence determination uncertain. Additionally, some of the species are known only from specific locations, such as isolated springs or dune habitats, lessening the likelihood of their occurrence in the Project Area.

Carson Valley Silverspot

Carson Valley silverspot (*Speyeria nokomis carsonensis*) occurs in permanent spring-fed meadows, seeps, marshes, and boggy, streamside meadows associated with flowing water and adequate supply of the larval food plant, bog violet (*Viola nephrophylla*; WildEarth Guardians 2010). No violet species have been observed in the Project Area. However, suitable habitat may occur in the Dixie Meadows.

Amphibians

Northern Leopard Frog

Northern leopard frog is a medium-size spotted frog that occurs in the vicinity of springs, slow streams, marshes, bogs, ponds, canals, floodplains, reservoirs, and lakes; usually they are in or near permanent water with rooted aquatic vegetation (NatureServe 2015). The northern leopard frog has undergone significant declines and population losses in Nevada that are largely due to habitat fragmentation and the introduction of nonnative fish, amphibian, and plant species. Only two populations remain in the Truckee and Carson River watersheds of western Nevada, which represents the western boundary of this species range (Rogers and Peacock 2012).

Northern leopard frogs require a mosaic of habitats, including aquatic overwintering and breeding habitats, as well as upland post-breeding habitats and the linkages between the two. In summer, this species commonly inhabits

wet meadows and fields. The species takes cover underwater, in damp niches, or in caves when inactive. Habitat degradation, fragmentation, and loss due to unsustainable grazing, water impoundments or other alterations, and development are the main threats to this species. Interactions with introduced species may also be contributing to declines. Inadequate information exists to adequately characterize current distribution and status/trend of individual isolated sub-populations (Wildlife Action Plan Team 2012).

Northern leopard frog could occur in the emergent marsh habitat in Dixie Meadows, where suitable habitat for this species is present. The species was reportedly observed during the 2009 biological survey in Dixie Meadows (see **Appendix D**) but was not observed during surveys in the Project Area in 2011 or 2016, though suitable habitat was present in the survey area.

NDOW has not recorded northern leopard frog in Dixie Meadows (WRC 2013).

A herpetological survey of US Navy Naval Air Station Fallon lands, including US Navy lands in the Dixie Valley, was conducted in 2011. Surveyors did not observe northern leopard frog in the Dixie Valley within suitable habitat. However, over 100 American bullfrog (*Lithobates catesbeianus*) were observed in these areas. Therefore, surveyors believed it is highly unlikely that northern leopard frog was present on these lands at the time of surveys (Rose et al. 2015). Northern leopard frogs were not documented during 2007 surveys on US Navy lands in the Dixie Valley (NAS Fallon 2008).

Dixie Valley Toad

There is currently an undescribed species of western toad (*Anaxyrus boreas*) that occurs in the proposed Project Area. The Dixie Valley toad, as the species is presently known, occurs on both US Navy and BLM-administered lands in the Dixie Meadows and is a potentially distinct, isolated, endemic species. Genetic and morphological analysis of potentially distinct species is in need of investigation and publication. The species occupies areas with perennial, ponded to slow-flowing water, with a fringe of vegetation for cover and suitable soils for burrowing. It digs its own burrow in loose soil or uses those of small mammals, or shelters under logs or rocks. The eggs and larvae develop in shallow areas of ponds, lakes, or reservoirs, or in pools of slow-moving streams (Wildlife Action Plan Team 2012).

Dixie Valley toads were frequently encountered on US Navy lands by surveyors in Dixie Meadows in 2011. Documentation of all life stages of these toads in the Dixie Meadows wetlands indicated successful recruitment in 2011 (Rose et al. 2015). Due to extremely limited recapture rates of tagged toads, accessibility issues, and insufficient resources, no accurate estimates of overall population abundance and structure are currently available (Forrest et al. 2013). The NDOW conducts annual surveys for this species and has previously pit tagged

approximately 200 toads to assist with monitoring the population size in Dixie Meadows.⁵

The Dixie Valley toad faces several potential threats stemming from its extremely limited distribution. Habitat modification from climate change (USFWS 2009, in Forrest et al. 2013) could reduce essential breeding habitat. Geothermal energy development in the Dixie Valley could alter water quality or quantity in its habitat (Forrest et al. 2013).

In 2011 and 2012, Dixie Valley toads and other nearby amphibian populations of western toads and American bullfrogs were tested for Bd. None of the Dixie Meadows or western toads sampled were positive for Bd. However, the prevalence of Bd infections among the nearby Turley Pond population of American bullfrogs increased significantly between samplings in 2011 and 2012. American bullfrogs are a known vector for Bd; the high incidence of the fungus among this nearby population of bullfrogs in Dixie Valley may represent a serious threat to Dixie Valley toads (Forrest et al. 2013).

Potentially suitable habitat for BLM sensitive invertebrates and amphibians is depicted on **Figure 6**, Surface Water.

Birds

Greater Sage-Grouse

Greater sage-grouse use a wide variety of sagebrush mosaic habitats with meadows and aspen (*Populus* spp.) in close proximity. This species roosts in sagebrush and also uses seeps, wet meadows, riparian areas, alfalfa fields, potato fields, and other cultivated and irrigated areas. Leks are located on relatively open sites surrounded by sagebrush, or in areas where sagebrush density is low, such as exposed ridges, knolls, or grassy swales (Schroeder et al. 1999). Nests are located in thick cover in sagebrush habitat and consist of a shallow depression on the ground.

The most significant threats to greater sage-grouse in Nevada are natural system modifications due to wildfire and the subsequent loss of habitat combined with impacts of invasive species (e.g., cheatgrass) and problematic native species encroachment (e.g., pinyon-juniper woodlands). Habitat fragmentation and disturbance is also a threat, particularly from roads and utility service lines as a result of both renewable and nonrenewable energy resources. Habitat degradation caused by improper grazing, recreational activities, and loss of upland meadows to mining are also threats (Wildlife Action Plan Team 2012).

In a letter dated May 29, 2013, NDOW stated that there are no known greater sage-grouse lek sites in the vicinity of the Project Area, and that greater sage-

⁵ Kris Urquhart, NDOW, discussions with Melanie Cota, BLM, in 2016, regarding Dixie Valley toad.

grouse habitat in the Project Area is primarily categorized as unsuitable habitat. Surveys in 2013 (WRC 2013) did not observe suitable habitat for greater sage-grouse in the Project Area, and did not observe individuals or sign, including scat, feathers, egg shells, or tracks (WRC 2013). However, the habitat mapping process for the 2015 Greater Sage-Grouse management plan amendment (BLM 2015a) classified portions of the Project Area, including a portion of the areas traversed by the northern gen-tie route, as OHMA. Approximately 14,000 linear feet (2.65 miles) of the northern gen-tie route traverses greater sage-grouse OHMA (BLM GIS 2016). NDOW also identified greater sage-grouse OHMA as described above (NDOW 2016).

Based on the newest 2016 USGS Greater Sage-Grouse habitat management categories map (Coates et al. 2016), the northern gen-tie traverses 17.1 miles of general habitat management area (GHMA) and 13.9 miles of priority habitat management area (PHMA). The southern gen-tie traverses 5 miles of GHMA and 3.3 miles of PHMA. However, the BLM requires a plan amendment or maintenance prior to adopting this map for land use plan decisions; therefore, the USGS 2016 habitat is not brought forward for analysis.

During additional coordination with NDOW, the agency identified three pending leks in the vicinity of the Project Area: the Fish Creek Basin 2, 5, and 6 leks.⁶ These leks are in the Fish Creek and Cottonwood Basins, on the east side of the Fish Creek Mountains. The nearest lek is on private land (approximately 3.8 miles from the northern gen-tie alignment in Jersey Valley; the other leks are on BLM-administered lands approximately 4.5 and 5 miles from the northern gen-tie alignment in Jersey Valley.

Golden Eagle

Golden eagles are generally found in open country, prairies, arctic and alpine tundra, open wooded country, and barren areas, especially in hilly or mountainous regions. In Nevada, they nest predominantly on rock ledges on cliffs and occasionally in large trees. Pairs may have several alternate nests and may use the same nest in consecutive years or shift to an alternate nest in different years. The species is vulnerable to reduction of prey populations due to degradation or loss of rangelands to development, wind turbine collisions, and potential disturbance causing nest abandonment (Wildlife Action Plan Team 2012).

Aerial surveys for golden eagle were conducted within 4 miles of the geothermal lease areas and northern gen-tie line route in 2011 (EMPSi 2016). Survey buffers were determined following USFWS guidance for similar geothermal utilization projects in the Coyote Canyon and New York Valley

⁶ Mark Freese, NDOW, e-mail to Morgan Trieger, EMPSi, on October 6, 2016, regarding greater sage-grouse NDOW data request response - additional leks.

Geothermal Resource Areas⁷ and were approved by the BLM.⁸ Golden eagle aerial surveys were conducted using the protocols outlined in the Interim Golden Eagle technical guidance (Pagel et al. 2010) and were conducted via a Bell 206L-4 helicopter. Surveys were conducted on June 27 and 28, 2011. Nine active confirmed golden eagle nests (5 of which were occupied at the time of the survey) and 16 inactive nests were recorded within 4 miles of the geothermal lease area and northern gen-tie line route. All nests were located in rock outcrops and on cliff faces in the ranges adjacent to Dixie Valley and Jersey Valley. Nest locations are shown on **Figure 8**, Raptor Nests.

The nearest active nest from the 2011 survey to any project component is located approximately 5,700 feet (1.1 miles) northwest of the geothermal lease boundary; this nest is located approximately 7,400 feet (1.4 miles) away from the proposed gen-tie. The nearest inactive nest from the 2011 survey is located 6,050 feet (1.2 miles) from the geothermal lease boundary and approximately 8,300 feet (1.6 miles) from the northern gen-tie (Ormat GIS 2016).

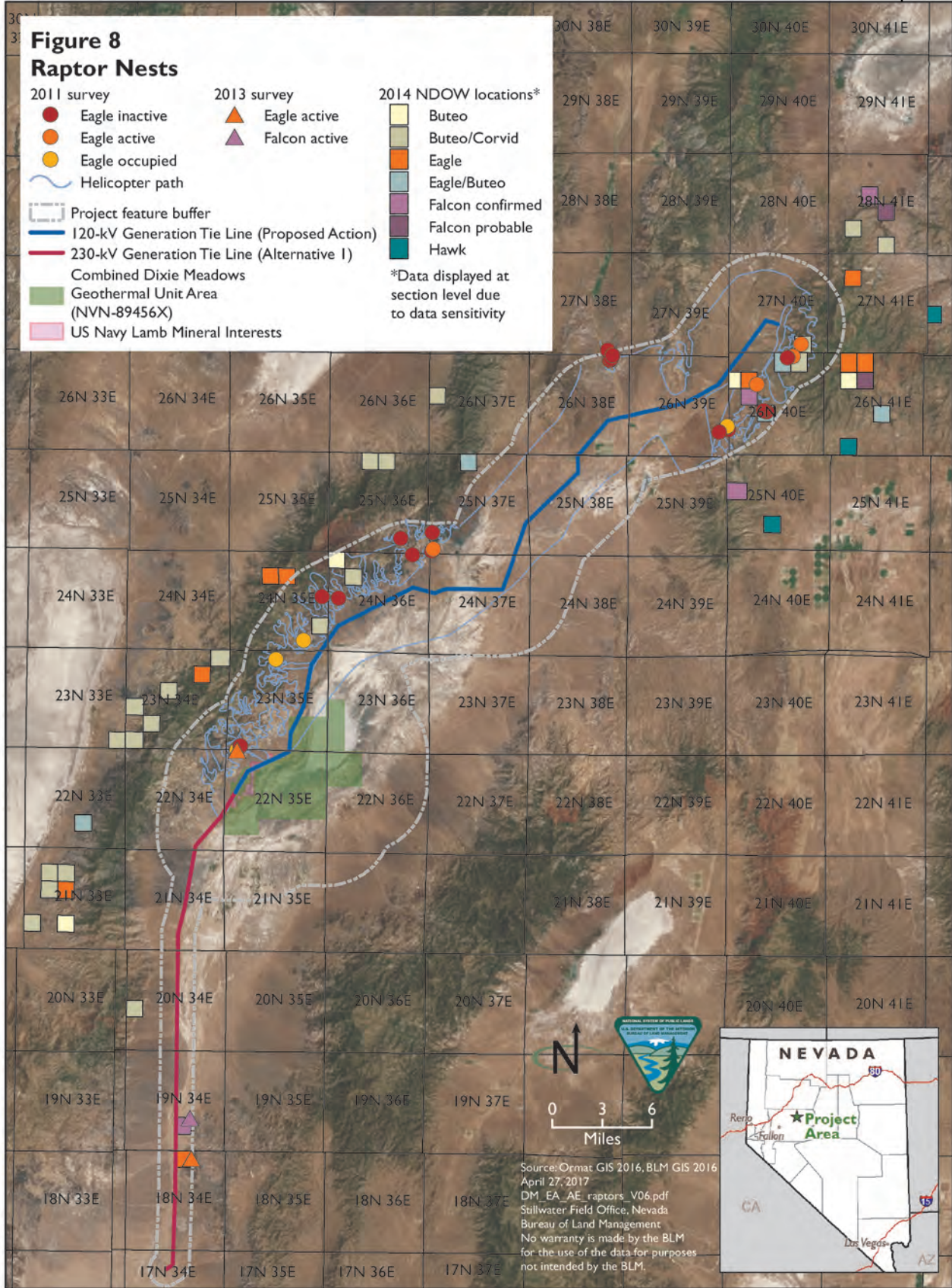
In addition, five adult golden eagles, five young-in-nest eagles, and one fledgling were observed during the aerial golden eagle survey. Additional details on observations are provided in the biological survey report (EMPSi 2016). Several other raptors were also incidentally observed. These include prairie falcon, turkey vulture, red-tailed hawk, ferruginous hawk (probable), and American kestrel. Surveyors noted that one observed inactive nest could have been a prairie falcon nest.

Ground surveys for golden eagle were conducted within the geothermal lease areas and the southern gen-tie line route and within a 1-mile buffer of this route between June and August 2013 (WRC 2013). Per consultation with NDOW, eight golden eagle nests occurred within 10 miles of the southern gen-tie route (WRC 2013). The NDOW provided an Excel table of UTM coordinates for these nest locations. Coordinates were plotted, and all nests within the 1-mile buffer were assessed for active or inactive status during the field surveys. One active nest was observed within the 1-mile buffer in the Louderback Mountains, approximately 4,940 feet (0.9 miles) from the southern gen-tie line, and an additional active nest is located approximately 500 feet outside of the 1-mile buffer in the Stillwater Range (this nest was also active in 2011 and is located 5,700 feet [1.1 miles] northwest of the geothermal lease boundary; this nest is located approximately 7,400 feet [1.4 miles] away from the proposed gen-tie as described above).

⁷ Steve Abele, USFWS, e-mail to Sue Fox, WRC, on November 17, 2010, regarding on the goea – again.

⁸ John Wilson, BLM, e-mail to Meredith Zaccherio, EMPSi, on June 6, 2011, regarding Dixie Hope golden eagle survey.

3. Affected Environment and Environmental Consequences



Although NDOW identified an additional golden eagle nest within the 1-mile buffer, this nest could not be located and suitable nesting habitat at the provided location is not present (WRC 2013). In addition, one adult golden eagle was observed perched on an existing wooden power line pole in the southern portion of the southern gen-tie alignment.

Ground surveys for golden eagle were also conducted within the geothermal lease areas and portions of the northern gen-tie line route and within a 1-mile buffer of these areas in June 2016 (EMPSi 2016). No golden eagles or nests were observed during the 2016 ground survey.

In summary, the nearest active nest observed during all surveys to any project component is approximately 4,940 feet (0.9 miles); this nest is located in the Louderback Mountains east of the southern gen-tie route. The nearest active nest to the lease areas and northern gen-tie route is located approximately 5,700 feet (1.1 miles) northwest of the geothermal lease boundary; this nest is located approximately 7,400 feet (1.4 miles) away from the northern gen-tie. The nearest inactive nest is approximately 6,050 feet (1.2 miles) from the geothermal lease boundary and approximately 8,300 feet (1.6 miles) from the northern gen-tie (Ormat GIS 2016).

Foraging habitat for golden eagles is present throughout the Project Area.

Ferruginous Hawk

Ferruginous hawk habitat includes open country, sagebrush, saltbush-greasewood shrubland, and the periphery of pinyon-juniper and other woodland and desert communities. In Nevada, ferruginous hawks nest primarily in live juniper trees, occasionally on tufa stacks and rock outcrops, sometimes on power line towers, and rarely on the ground (Wildlife Action Plan Team 2012). Suitable foraging and nesting habitat is present in the Project Area.

Swainson's Hawk

Swainson's hawk forages in savanna, open pine-oak woodland, and cultivated lands (e.g., alfalfa and other hay crops, and certain grain and row croplands) with scattered trees, usually near riparian areas. It nests typically in a solitary tree, bush, or small grove; sometimes it nests on rock ledges. Suitable foraging and nesting habitat is present in the Project Area.

Burrowing Owl

Burrowing owl optimum habitat is typified by short vegetation and the presence of recent, small mammal burrows. This species is found in open grasslands, sagebrush, and sagebrush-steppe, and sometimes in open areas such as vacant lots near human habitation. In Nevada, burrowing owl is vulnerable to habitat loss and fragmentation primarily due to urban land conversion, and habitat degradation from control and extermination of colonial burrowing mammals. It is also vulnerable to vehicle collisions, predators, disturbance, harassment by

dogs, collapse of burrows, and alterations in food availability (Wildlife Action Plan Team 2012).

Burrowing owls and their active burrows were observed in three locations during the 2011 surveys within one-half mile of the northern gen-tie line; no burrowing owls were observed at these locations in 2016 (see Figure 4 in EMPSi 2016). In 2011, the entrance to burrow 1 had scat and a few pellets. An owl was perched at the burrow, and a second owl flew east from this location. As such, it is likely there is a pair nesting at this site. Burrow 2 is lined with cow scat and had no pellets, scat, white-wash, or feathers. It is adjacent to the main dirt road and is east of burrow 1. A single owl was observed perched on the dirt mound at burrow 3. Fresh pellets, scat, and white-wash were noted at the burrow entrance.

Burrowing owls can form loose nesting colonies, and it is possible there is a colony of burrowing owls in this area. Colonies often form where colonial ground squirrels are present due to the abundance of holes. However, the three burrows observed during the field survey were likely dug by badgers based on their shape, dimensions, and old nail marks on the side walls.

Inactive burrowing owl burrows were observed during surveys in 2016, but no owls were observed. Inactive burrows exhibited signs of past use by burrowing owls, including old pellets. No feathers or whitewash were observed at the burrows, and cobwebs and vegetation were partially covering burrow entrances (see Figure 4 in EMPSi 2016).

Burrowing owl point count surveys were conducted along the southern gen-tie alignment and within the lease areas on July 7 and 8, 2013 (WRC 2013). The survey tiered off Conway and Simon (2003). Additionally, meandering transects were walked throughout the southern gen-tie alignment and lease areas; biologists focused on burrowing owl and their sign during these transects. No burrowing owls or their sign (e.g., burrows, pellets, feathers, tracks, white-wash, or insect parts on dirt mounds) were observed; no burrowing owls were detected during the broadcast surveys. Potentially suitable foraging and nesting habitat is present throughout the southern gen-tie alignment, although the northernmost portions that are densely vegetated with greasewood are less likely to be occupied by burrowing owls. Borrowing owls were observed near the southern gen-tie in the Dixie Settlement area, and NDOW has a 1987 record for burrowing owls approximately 2.3 miles southwest of the southwest portion of the southern gen-tie alignment. This location is characterized as grasslands with sparse shrubs (WRC 2013).

Western snowy plover

Western snowy plovers are often seen on alkali playas near standing pools of shallow water. During times of drought they rely heavily on artesian wells and springs that spill water onto the dry playas. Snowy plovers generally nest on recently exposed alkaline flats (Paton and Edwards 1990). They are vulnerable

to habitat loss from development and as a result of dewatering of playas or springs during the breeding season due to water diversions, drought, or climate change (Wildlife Action Plan Team 2012). Western snowy plover may use playa habitat in the Dixie Valley for breeding and foraging. This species was documented in Dixie Valley in 2009.

Peregrine Falcon

Peregrine falcons forage in various open environments, including open water, desert shrub, and marshes, usually in close association with suitable nesting cliffs. When not breeding, they occur in areas where prey concentrate, including marshes, lake shores, rivers and river valleys, cities, and airports. In Nevada, Peregrine falcons often nest on a ledge or in a hole on the face of a rocky cliff or crag (Wildlife Action Plan Team 2012). Suitable foraging habitat is present in the Project Area; suitable nesting habitat is present in adjacent mountain ranges. Staff at NAS Fallon have observed this species in the Dixie Valley Settlement Area.

Bald Eagle

Bald eagle usually nests in tall trees or on cliffs near bodies of water that provide a food base. Nests located on cliffs and rock pinnacles also have been reported historically in Nevada. Bald eagle winters throughout Nevada; winter distribution is influenced by waterfowl concentrations or bodies of water (Wildlife Action Plan Team 2012). There is no suitable nesting habitat present in the Project Area, though potential wintering habitat may be present. No bald eagle nests have been documented within 10 miles of the Project Area (WRC 2013).

Loggerhead Shrike

Loggerhead shrikes breed in open country with scattered trees and shrubs, savanna, desert scrub, and, occasionally, open woodland. They often perch on poles, wires, or fence posts, and suitable hunting perches are an important part of the habitat (Yosef and Grubb 1994). Loggerhead shrikes nest in shrubs or small trees (Wildlife Action Plan Team 2012). Several foraging loggerhead shrikes were observed during the 2016 surveys along the northern gen-tie alignment. No active or inactive nests were observed in the vicinity of the observations (see Figure 4 in EMPSi 2016).

Sage Thrasher

In the northern Great Basin, sage thrasher breeds and forages in tall sagebrush, sagebrush/juniper, mountain mahogany, and sagebrush/aspen communities (Maser et al. 1984). This species generally nests in sagebrush shrubs, in a branch fork near the ground. In winter, it uses arid and semi-arid scrub, brush, and thickets (Wildlife Action Plan Team 2012). Sage thrasher may use sagebrush habitat in the Project Area. It was not observed during the 2016 surveys.

Brewer's Sparrow

Brewer's sparrow is strongly associated with sagebrush, where it nests low in sagebrush shrubs (Wildlife Action Plan Team 2012). Brewer's sparrow may use sagebrush habitat in the Project Area. It was not observed during the 2016 surveys.

Mammals

Bats

Foraging habitat exists throughout the Project Area for the BLM Sensitive bat species. Numerous species of bats have been acoustically detected in the Dixie Meadows area, as described below.

No bat roosting habitat, such as abandoned buildings, mine workings (e.g., shafts, adits, and inclines), trees, rock outcrops, or cliffs, is present in the immediate vicinity of project components; however, roosting habitat is present in numerous locations within a mile of project components, including the northern gen-tie line. Such roosting habitat includes abandoned mine lands in the Jersey Valley, rock outcrops and cliffs in several locations, and live and dead riparian trees in Dixie Meadows, as described below.

The primary structural bat roosting habitat in the immediate vicinity of project components is the wooden power poles associated with the existing transmission line. Bats could potentially roost in these power poles if woodpecker holes are present. While not all power poles were surveyed, those that were scanned did not have any cavities. Moreover, no evidence of decay or rotting in the power poles, which could produce flaking or locations where bats could roost, was noted. It is likely that these poles are carefully maintained and if they began to decay, they would be replaced. Thus, although bats could forage over the shrubs found in the mixed salt desert scrub and greasewood habitats, the plants in this habitat type do not provide suitable long-term night and day roosting sites.

Bat acoustic detectors were deployed over two nights from July 7 to 8, 2013. Detectors were placed at several locations in Dixie Meadows within and east of the lease areas and near the southern end of the southern gen-tie alignment, as shown in WRC (2013). In the meadows, the detectors were placed along the periphery of the meadow near trees such as tamarisk and Russian olive, and near open water in channels and small ponds. Several bat species were detected in the Dixie Meadows locations; species detected were Brazilian free-tailed bat, California myotis, small-footed myotis, and western pipistrelle. No bats were detected in the lease areas or at the southern gen-tie detector locations (WRC 2013).

Suitable roosting habitat for bats is likely present outside the Project Area, within live and dead trees surrounding ponds in Dixie Meadows, within rock outcrops and abandoned mine workings in the adjacent Stillwater Range and

Louderback Mountains, and within the Dixie Valley Settlement Area east of the southern gen-tie line route in mature trees and old buildings (WRC 2013; EMPSi 2016).

Eight species of bats were recorded at Dixie Meadows during acoustic surveys performed in April and May 2007, according to the Ecological Inventory Update Naval Air Station Fallon Nevada August 2008. Besides the four species recorded during 2013 surveys, pallid bat, silver-haired bat, hoary bat, and Yuma myotis were also recorded (WRC 2013). In addition, the 2014 Final Integrated Natural Resource Management Plan and Environmental Assessment Naval Air Station Fallon, Nevada (NASF 2014) cites a 1997 ecological inventory that found long-legged myotis in old buildings in the Dixie Valley Settlement Pond Area.

The NDOM maintains a database of abandoned mine workings in the state. Coordination with NDOM indicates that at least eight abandoned mine workings, including shafts, adits, and declines, are present within 0.6 miles (1 kilometer) of the project (NDOM 2016). As discussed, these features may provide suitable roosting areas for bat species.

NDOW has documented several bat species near the Project Area. Species documented are pallid bat, Townsend's big-eared bat, California myotis, long-eared myotis, small-footed myotis, long-legged myotis, Yuma myotis, and western pipistrelle (NDOW 2016).

The NDOW also indicated that pallid bat and Townsend's big-eared bat maternity and hibernation roosts are present in Jersey Valley, near the northern gen-tie line.⁹ Roosts are present in abandoned mine lands, less than 500 feet from Ormat's Jersey Valley Geothermal Power Plant, at the terminus of the proposed northern gen-tie alignment. Several of the abandoned mine lands in this area have been gated to prevent human entry while allowing for bat use, but additional compatible closures are needed to protect maternity roosts.

Foraging habitat is present in the Project Area for big brown bat, spotted bat, western red bat, little brown myotis, and fringed myotis. However, these species have not been documented in or near the Project Area.

Pygmy rabbit

Pygmy rabbits are found primarily on big sagebrush dominated plain and alluvial fans where plants occur in tall, dense clumps (Green and Flinders 1980). Deep, friable, loamy-type soils are required for burrow excavation. They may occasionally use burrows excavated by other species (e.g., yellow-bellied marmot). Therefore, they may occur in areas that support shallower, more compact soils as long as sufficient shrub cover is available (USFWS 2010).

⁹ Jenni Jeffers, NDOW, phone call with Morgan Triege, EMPSi, on October 7, 2016, regarding biological resources.

Threats include livestock grazing, wildfire, invasive species, and climate change (Wildlife Action Plan Team 2012). No pygmy rabbits, burrows, scat, or tracks were observed during the surveys. There is no suitable habitat in the Project Area. However, pygmy rabbits have been observed in suitable habitat in the vicinity of the Project Area in the Jersey Valley.

Kangaroo mice

Both pale and dark kangaroo mice are BLM sensitive species and Nevada protected mammals (NAC 503.030). These animals are associated with intermountain (cold desert) scrub habitat, which is the most common habitat type in the Project Area. In this habitat type, both species are found in shadscale, sagebrush, and alkali sink plant communities, which are present in the Project Area.

Both species are strongly associated with sandy soils. The pale kangaroo mouse may be more ecologically specialized than the dark kangaroo mouse (Hafner et al. 2008). It is typically restricted to deep, sandy soils with little or no gravel, usually below the sagebrush zone. The dark kangaroo mouse, on the other hand, is tolerant of a wide range of sandy substrates and vegetation associations.

Field surveys in the geothermal plant area and southern gen-tie ROW (WRC 2013) suggest that small-scale surface deposits of sand, indicative of pale kangaroo mouse habitat, were common in the southern portion of the southern gen-tie route. Also, there is a record from 1950 of the pale kangaroo mouse. It was recorded on US Navy lands southwest of the Project Area, in the US Naval Electronic Warfare Training Area. Thus, the pale kangaroo mouse has the potential to occur, particularly in the southern portion of the Project Area. The dark kangaroo mouse, with more general habitat preferences, also has the potential to occur there.

Small mammals were not trapped in the Project Area as part of project surveys. Burrows typical of kangaroo rats (*Dipodomys* spp.) were noted throughout the southern gen-tie route. One Heteromyidae rodent (an unidentified species of kangaroo rat) was observed during the field survey (WRC 2013).

Bighorn sheep

Bighorn sheep occur in alpine to desert grasslands or shrub-steppe in mountains, foothills, or river canyons. Escape terrain (e.g., cliffs and talus slopes) is an important habitat feature (Wildlife Action Plan Team 2012). Bighorn sheep have been recorded in the Stillwater Range (EMPSi 2016), to the west of the Project Area. Suitable breeding habitat is limited to the higher, rocky portions of the adjacent ranges. However, the species may use portions of the Project Area for foraging or for access to water. Bighorn sheep could also use the Project Area if they were to disperse to the Clan Alpine Mountains on the east side of Dixie Valley, which is also occupied bighorn sheep habitat.

3.8.2 Environmental Consequences

Proposed Action (Northern Gen-tie Route)

Impacts on BLM sensitive wildlife species habitat from the Proposed Action would generally be the same as those described in **Section 3.5**, Migratory Birds; **Section 3.6**, Vegetation; and **Section 3.7**, Wildlife and Key Habitat. Impacts would be avoided or minimized by adherence to the environmental protection measures and additional mitigation measures as described in these sections. Additional impacts on BLM sensitive plant and wildlife species, as well as measures to avoid, reduce, or mitigate impacts, are described below.

Plants

Direct impacts on the BLM sensitive plant species sand cholla could occur during construction of the northern gen-tie line. Direct impacts could come from crushing, uprooting, or injuring the plant, potentially resulting in mortality or reduced reproductive success. Indirect impacts could occur if excessive dust mobilized during construction were to settle on the plant. This could suppress physiological processes or pollinator success.

Impacts to sand cholla would be avoided by flagging or fencing and by applying an appropriate buffer determined by the qualified botanist and the BLM.

If avoidance is not feasible, mitigation would be determined by the BLM, which could include transplantation, seed collection, grow out and plantings, or other methods determined appropriate by the BLM.

Botanical surveys in the Project Area have not recorded any other BLM sensitive plant species, although potential habitat exists for eight other BLM Sensitive plant species in and near the Project Area. These species are:

- Sodaville milkvetch
- Tonopah milkvetch
- Sagebrush pygmyleaf
- Tiehm blazingstar
- Oryctes
- Nevada dune beardtongue
- Lahontan beardtongue, and
- Playa phacelia

Full preconstruction surveys would be conducted prior to any surface disturbance for the project within potential habitat for these species. If any BLM sensitive plant species are detected, they would be avoided by imposing buffers until construction is complete, using the methods for sand cholla avoidance described above. If avoidance is not possible, the BLM would determine the

appropriate mitigation required for no net loss of the species. All natural processes that create and maintain sensitive species habitat shall be protected and preserved.

Population viability for any one species is not expected to be in jeopardy as a result of implementing the Proposed Action. This is due to the environmental protection measures and additional mitigation measures for BLM Sensitive species. In addition, the Proposed Action is not expected to contribute to the need for listing any BLM sensitive species.

Mitigation measures for sensitive plants are as follows:

- Surveys would be conducted for all known and potential occurrence of BLM Sensitive and NNHP plant species within suitable habitat of the Project Area footprint by qualified botanists and protocols approved by the BLM.
- If sensitive plant species are identified within the project work area, impacts would be avoided by flagging/fencing and by applying an appropriate buffer determined by the qualified botanist and the BLM. If avoidance is not feasible, mitigation would be determined by the BLM to ensure no net loss of sensitive plants.

Invertebrates

Suitable habitat for sensitive butterflies, including the Carson Valley wood nymph, pallid wood nymph, and Carson Valley silverspot, may be present in Dixie Meadows. Constructing the northern gen-tie route through a portion of the northern Dixie Meadows may crush individual butterflies on host vegetation in the construction area. Impacts would be most likely if they were to occur during one of the species' non-adult life phases, when it would be relatively immobile. If construction were to occur during the flight stage of these species, the individuals would likely disperse from the area into nearby suitable habitat. Potential impacts would be minimized by using existing routes for construction access in sensitive meadow vegetation and by avoiding and minimizing ground disturbance and vegetation removal in this area to the extent possible.

Potential impacts on the Dixie Valley pyrg are discussed in more detail below.

Dixie Valley pyrg, northern leopard frog, Dixie Valley toad

Springs and surface waters in Dixie Meadows provide habitat for and support populations of the BLM sensitive Dixie Valley toad and Dixie Valley pyrg, and provide suitable habitat for the BLM sensitive northern leopard frog.

Direct impacts on the Dixie Valley toad in its terrestrial habitat could occur during construction of the power plants, well pads, and gen-tie line near breeding habitat in Dixie Meadows. Toads may use terrestrial habitat to forage.

They may use rodent burrows for overwintering or thermal refuge during high temperatures.

There is a high likelihood that toads use terrestrial habitat near breeding habitat in Dixie Meadows; therefore, surface grading could crush or bury toads using burrows in the construction area. Moreover, toads dispersing in the construction area could be crushed by vehicles or machinery. To avoid this potential impact, suitable exclusion fencing would be installed around the perimeter of the work area near suitable breeding habitat in Dixie Meadows. Preconstruction surveys by a qualified biologist would ensure that toads are not present in the construction area. If toads were observed, they would be relocated into suitable habitat outside exclusion fencing.

The project could indirectly impact Dixie Valley toad and Dixie Valley pyrg, their habitat, and suitable habitat for northern leopard frog. This would be the case if geothermal utilization were to alter suitable wetland habitat in Dixie Meadows. If water quality, quantity, or temperature were to be altered by geothermal production, this could reduce habitat suitability for these species.

Existing thermal conditions in the Dixie Hot Springs may be limiting or excluding chytridiomycosis infection in Dixie Valley toads (Forrest and Schlaepfer 2011; Forrest et al. 2013). Because Dixie Meadows represents the entire known distribution for the Dixie Valley toad, significantly reduced habitat suitability or Bd introduction could result in extirpation.

Similarly, indirect impacts are not anticipated for the Dixie Valley toad and Dixie Valley pyrg or their habitat or on suitable habitat for northern leopard frog from changes in water quality. Examples of these impacts are erosion and runoff and sedimentation, resulting in reduced water quality, from surface disturbance in the Project Area. This is because ephemeral washes and drainages would be avoided to the extent possible. Moreover, erosion environmental protection measures (**Section 2.1.6**) would minimize impacts where proposed roads must cross ephemeral drainages. Such roads could convey runoff to wetlands, ponds, or other downstream habitat supporting the Dixie Valley toad, Dixie Valley pyrg, or suitable habitat for northern leopard frog.

Environmental protection measures also include minimizing soil disturbance, intercepting stormwater in ditches and energy dissipaters, maintaining access roads consistent with BMPs, and following BLM BMPs for stormwater on public lands.

Mitigation measures for sensitive aquatic species are as follows:

- ORNI 32 would implement the Aquatic Resources Monitoring and Mitigation Plan. Implementing the plan would allow any direct or indirect adverse impacts on Dixie Valley toad, Dixie Valley pyrg, and northern leopard frog and habitats to be avoided, minimized, and

mitigated as needed. This plan would be developed in coordination with the BLM, ORNI 32, and the cooperating agencies and finalized prior to a decision for the project.

- The project would be in compliance with BLM Manual 6840, Special Status Species Management.
- A wetland delineation would occur within Dixie Meadows, including on BLM- and US Navy-administered lands. This would allow sensitive resource areas to be delineated for appropriate buffers.
- Surveys would be conducted for known and potential occurrences of Dixie Valley toad, Dixie Valley pyrg, and Northern leopard frog and any other sensitive wildlife species within all suitable habitat by qualified biologists and protocols approved by the BLM.
- Once delineation is complete, an appropriate surface disturbance avoidance buffer would apply to all special status aquatic wildlife species riparian habitat within Dixie Meadows (see full lease stipulations in **Appendix A**). This buffer shall ensure adequate protection of riparian habitat for these species.
- Exclusion fencing approved by the BLM would be installed around all work areas near special status aquatic wildlife species habitat, and preconstruction surveys would be conducted to ensure no direct impacts would occur to these species.
- Transmission towers would be sited to span identified special status aquatic species habitats, as defined by the wetland delineation. Stringing sites and other temporary work areas would be sited outside of special status species habitats.
- All sumps would be fenced to ensure they are amphibian proof. The Geothermal Sump Strategy provided by the NDOW would be implemented.
- Monitoring and mitigation measures outlined in **Section 3.3**, Water Resources and **Section 3.9**, Wetlands and Riparian Areas would also serve to protect these sensitive species. These include establishing appropriate triggers for any adverse impacts seen in water quantity, quality, and temperature as well as appropriate frequency of monitoring efforts.
- Additional monitoring and mitigation measures would be developed and outlined in the Aquatic Resources Monitoring and Mitigation Plan. The plan would include adaptive management and reporting. Implementation of the plan would ensure a no net loss of special status species and habitats that can be shown to be a result of the Proposed Action.

Birds

Greater Sage-Grouse

Implementation of the Proposed Action would result in approximately 104 acres of disturbance of greater sage-grouse OHMA (BLM GIS 2016); of the 104 acres, 103 acres would be reclaimed following construction. Appendix C of the Greater Sage-Grouse ROD (BLM 2015a) includes RDFs that are required for certain activities in all greater sage-grouse habitat, including areas mapped as OHMA. The RDFs are included as **Appendix B** of this EA. RDFs establish specifications to help mitigate adverse impacts on the species. RDFs would not apply outside of greater sage-grouse OHMA.

In addition to the RDFs, the Decision requires compliance with lek buffers (Decision Appendix B), Fluid Mineral Stipulations (Decision Appendix G), and Noise Protocol (Decision Appendix M), as well as applicable Special Status Species, Leased Fluid Minerals, and Land Use Authorizations Management Decisions outlined in Decision Section 2.2.

ORNI 32 would comply with the applicable RDFs in greater sage-grouse OHMA, lek buffers, fluid mineral stipulations, and noise protocol, as well as applicable management decisions in the Decision, as outlined in Section 1.4, Land Use Plan Conformance. Sagebrush habitat would be avoided to the extent possible by using existing roads or other areas devoid of sagebrush (WO-IM-2012-043). Additionally, all power poles would use BLM-approved raptor deterrents in greater sage-grouse habitat, in accordance with the RDFs. With adherence to the protection measures, in addition to greater sage-grouse Decision conformance, potential impacts on greater sage-grouse would be further reduced.

Golden eagle

Implementation of the Proposed Action would result in a net loss of golden eagle foraging habitat for the life of the project. While the project site does not support golden eagle nesting habitat, it is expected that golden eagles could forage within the Project Area throughout the year. Due to the size of the project compared with available foraging habitat, population-level effects on golden eagles in the region are unlikely from loss of foraging habitat.

The nearest active nest to the lease areas and northern gen-tie route is located approximately 5,700 feet (1.1 miles) northwest of the geothermal lease boundary; this nest is located approximately 7,400 feet (1.4 miles) away from the northern gen-tie. The nearest inactive nest is approximately 6,050 feet (1.2 miles) from the geothermal lease boundary and approximately 8,300 feet (1.6 miles) from the northern gen-tie (Ormat GIS 2016).

Operation of the gen-tie line could result in direct mortality to golden eagle from striking the gen-tie line or electrocution, similar to impacts as discussed under **Section 3.5**, Migratory Birds. Indirect, temporary effects from noise,

human presence, and heavy equipment present during construction activities may lead to disturbance or displacement. This may lead to nesting failure or abandonment, constituting take under the Bald and Golden Eagle Protection Act.

To minimize and avoid impacts, design features (APLIC 2006, 2012) and construction timing restrictions would be incorporated. These measures are described in detail in Section 5.1 of the BBCS (**Appendix C**). As a result, neither construction nor operation of the project is expected to result in take or disturbance of golden eagles as defined under the Bald and Golden Eagle Protection Act.

Burrowing owl and western snowy plover

Three active burrowing owl burrows were observed within half a mile of the northern gen-tie alignment in 2011; inactive burrowing owl burrows were observed in 2016, along the northern gen-tie alignment. Western snowy plover has the potential to occur on playa habitat traversed by the northern gen-tie alignment.

Construction could impact burrowing owl or western snowy plover by reducing available nesting or foraging habitat. It could also cause individuals to avoid foraging in otherwise suitable habitat. This would be due to increased human or equipment presence or noise. These factors could cause owls to abandon their burrows or plovers to abandon nests. Increased scavenger or raptor perching opportunities may also increase the risk of predation on these species and their young.

Impacts would be avoided or minimized by adhering to the measures outlined in Section 5.2 of the BBCS (**Appendix C**), including conducting preconstruction surveys.

Environmental protection measures under the Proposed Action would further reduce impacts. These include reclaiming temporarily disturbed areas, to promote the reestablishment of native plant and wildlife habitat, and using BLM-approved raptor perch deterrents on power poles.

Loggerhead shrike, sage thrasher, and Brewer's sparrow

Impacts on BLM sensitive loggerhead shrike, sage thrasher, and Brewer's sparrow from the Proposed Action would be the same as those described in **Section 3.5**, Migratory Birds. Impacts would be avoided or minimized by adhering to the mitigation measures outlined in Section 5.2 of the BBCS (**Appendix C**), including conducting preconstruction surveys.

Sensitive raptor species

Impacts on BLM sensitive raptor species, including ferruginous hawk, Swainson's hawk, Peregrine falcon, and bald eagle, from the Proposed Action would be the same as those described in **Section 3.5**, Migratory Birds. Impacts would be

avoided or minimized by adhering to the mitigation measures outlined in Section 5.2 of the BBCS (**Appendix C**). These include conducting preconstruction surveys and implementing APLIC (2006, 2012) guidelines.

Mammals

Bats

A BBCS (**Appendix C**) was developed. Its purposes are to reduce the potential of injury or mortality to bats from project construction and operation, to ensure adequate monitoring is in place to determine if mortalities are occurring, and to provide a mechanism to implement adaptive management as needed to reduce injury or mortality.

Ponds, tanks, and impoundments (including but not limited to drill reserve pits) containing liquids can present hazards to bats (BLM 2008c). Bat access to any liquids contaminated by substances that may be harmful due to toxicity, fouling of the coat (detergents and oils), or excessive temperatures would be excluded by wildlife-proof netting or other covering at all times when not in active use. This measure would conform to Appendix D, Best Management Practices – Mitigation Measures, of the BLM’s 2008 geothermal leasing PEIS (see **Appendix F** of this EA). Netting specifications are given in the additional mitigation measures in **Section 2.1.6**.

Direct impacts on the abandoned mine workings near the Jersey Valley Geothermal Power Plant are not anticipated, as these sites are avoided, no activities are proposed at these sites, and no drilling through underground workings is proposed. However, these sites have a high hazard rating due to human activity and the extent of workings. To reduce the potential for any impacts on either bats, which use the workings, or to human safety, no mines would be entered.

Construction noise and activities could impact roosting bats adjacent to the Project Area. Because abandoned mine workings near the Jersey Valley Geothermal Power Plant function as hibernation and maternity locations, disturbance to roosting bats could be especially damaging to local populations if impacts were to occur during critical hibernation and maternity periods. However, construction activities in this area would be limited to installing several power poles and connecting the northern gen-tie to the existing substation. Construction duration would be temporary. Further, the existing power plant at this location would serve to reduce the effects of potential disturbance from the gen-tie installation. Therefore, any effects on roosting bats at this location are expected to be minor.

The quieter and more consistent background noise associated with power plant operation could affect bat foraging ability. Bats may be affected by the power plants’ operational noise. This is because they echolocate and receive sound waves in a wide range of frequencies, including those both audible and inaudible

to humans. Additionally, operational noise may disrupt bat foraging behavior by acoustic masking, attentional distraction, and eliciting an avoidance response.

In effect, noise may create a larger area of habitat disturbance than the project footprint alone. Operation noise would be minimized by designing the plants to take advantage of noise-reducing design, including from cooling fans, as described in **Section 2.1.3**. Vinyl fencing slats surrounding the plants would also reduce operational noise in adjacent habitat. BLM regulations mandate that noise at one-half mile—or at the lease boundary if closer—from a major geothermal operation shall not exceed 65 A-weighted decibels (43 CFR, Subpart 3200.4[b]).

Foraging habitat for bats is available throughout the Project Area, particularly meadow areas near the geothermal lease areas. Impacts on foraging habitat would affect only individual bats and would not impact the local or regional bat population. This is because bats would likely forage in adjacent undisturbed habitats.

Additionally, adverse impacts on the springs and seeps in the project vicinity are unlikely, given avoidance and minimization measures in **Section 3.3**, Water Resources, and **Section 3.9**, Wetlands and Riparian Vegetation; therefore, indirect impacts on the associated foraging habitat are anticipated to be minor.

Lights used for drilling at night and power plant operations may attract and concentrate moths and other insects on which bats may feed, which could be a beneficial effect, though this could also alter bat behavior. To reduce the impacts on bats from project lighting, motion activated lighting, directed lighting, shielding methods, and/or reduced lumen intensity lighting would be used.

Pygmy rabbit

The Project Area has marginal habitat for pygmy rabbits, and no pygmy rabbits or their sign were observed during the biological surveys. However, pygmy rabbits have been observed in the project vicinity and could be impacted by the project. Pygmy rabbits could be injured or killed by project construction or vehicle traffic or have burrows crushed by equipment. Vehicle speeds would be limited to 25 mph through the area, and roads would be watered during construction and operations as necessary to control dust. Preconstruction surveys would be required in all suitable habitat, and burrows would be avoided. Any impacts on the species or habitat would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species.

Kangaroo mice

Surface disturbance associated with construction could result in the loss of kangaroo mouse habitat. Given the limited surface disturbance, habitat impacts would be minimal and concentrated around the power plants, well pads, and gen-tie construction areas. Similar habitat that would not be impacted is abundant in the project vicinity.

Additional construction crew traffic would increase the probability of running over a kangaroo mouse, especially if vehicles are used at night; however, vehicle speeds would be limited to 25 mph through the area, and nighttime construction and operation traffic is not proposed. Dixie Valley Road is open to public use, and likely sees some nighttime use; therefore, any additional construction-related traffic would have only incremental impacts over existing conditions.

Artificial night lighting sources used primarily during drilling and construction and, to a lesser extent, during project operations, could impact kangaroo mice if they were present in the lit area. Using artificial night lighting may cause nocturnal rodents (such as kangaroo mice) to decrease activity (Kramer and Birney 2001; Clarke 1983) and alter foraging behavior (Vasquez 1994). Also, using artificial night lighting can increase owl hunting effectiveness on nocturnal rodents (Clarke 1983). To reduce impacts on kangaroo mice from project lighting, motion activated lighting, directed lighting, shielding methods, and reduced lumen intensity lighting would be used.

Preconstruction surveys for BLM sensitive wildlife species would be conducted. If kangaroo mice were observed during such surveys, measures to avoid or minimize impacts would be developed, in coordination with BLM or NDOW or both.

With incorporation of the measures above, potential impacts may affect any kangaroo mice in the Project Area; however, impacts would not cause a loss of viability to the population or species.

Bighorn sheep

Impacts on bighorn sheep may occur from noise or human presence during construction. Bighorn sheep may avoid foraging in or crossing through the Project Area during construction, but this impact would be temporary.

Alternative I (Southern Gen-tie Route)

The nature and type of impacts on sensitive species and their habitat under Alternative I would be similar to those described under the Proposed Action. However, Alternative I would result in 10 fewer acres of habitat disturbance. The environmental protection measures in **Section 2.1.6**, implementation of other plans described in that section, implementation of the BBCS (**Appendix C**), and their associated impacts under Alternative I are the same as those described under the Proposed Action. Regardless of the gen-tie line routing option chosen under Alternative I, impacts from either routing option would be the same.

Implementation of Alternative I would disturb approximately 1,354 acres of habitat, 1,242 acres of which would be reclaimed following construction.

The southern gen-tie alignment would not impact Dixie Meadows or any other seeps, springs, wetlands, or riparian vegetation. Because this alternative does not include gen-tie construction or operation within wetland or riparian areas, direct and indirect impacts on BLM sensitive species and habitats would likely be substantially reduced, compared with the Proposed Action.

There is no mapped greater sage-grouse habitat within the southern gen-tie route, so implementation of Alternative I would have no impacts on greater sage-grouse or its habitat. Compliance with the Greater Sage-Grouse ROD (BLM 2015a) would not apply under Alternative I.

The nearest active golden eagle nest to the southern gen-tie route is approximately 4,940 feet. Since the nearest active nest to the southern gen-tie alignment is approximately 2,460 feet closer than the nearest active nest to the northern gen-tie alignment, the potential for impacts from collision or electrocution would be somewhat increased under Alternative I. However, environmental protection measures under Alternative I are the same as those described under the Proposed Action, including implementation of the BBCS (**Appendix C**).

Potential impacts on pale kangaroo mouse may be more likely under Alternative I. This is because suitable habitat for this species is more prevalent in the southern portion of the southern gen-tie alignment. The pale kangaroo mouse occurs in habitats with sandy, wind-blown soils or active or stabilized dunes, and these habitats are present in the southern gen-tie line route. In order to avoid or minimize impacts on these species, preconstruction surveys would be conducted within suitable habitats in early spring to determine presence or absence of these species. If present, specific avoidance and/or minimization measures would be determined in consultation with the BLM or NDOW or both.

Several BLM sensitive plant species also have potential to occur in sandy soils along the southern gen-tie route; however, they were not detected during focused botanical surveys in 2013 (ESRS 2013). Therefore, no additional impacts on BLM sensitive plants are expected from implementation of Alternative I.

No Action Alternative

Under the No Action Alternative, the BLM would not approve the Proposed Action, the facilities would not be constructed, and ORNI 32 would likely suspend exploration activities authorized under the two previous Decision Records for the foreseeable future. As such, there would be no change in existing BLM sensitive species conditions at the site.

3.9 WETLANDS AND RIPARIAN AREAS

3.9.1 Affected Environment

The Clean Water Act (CWA), as amended in 1977, established the basic framework for regulating discharges of pollutants into the Waters of the United States, including wetlands. The US Army Corps of Engineers (USACE) regulates the discharge of dredged and fill material into Waters of the United States, including wetlands, in accordance with Section 404 of the CWA and Section 10 of the Rivers and Harbors Act of 1899.

The USACE describes wetlands as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances, do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.”

Federal jurisdiction over a non-wetland water of the United States extends to the ordinary high water mark (OHWM). The OHWM is “that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas” (33 CFR, Subpart 328.3[e]).

Signed in 1977, Executive Order 11990 directs federal agencies to prevent the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands in carrying out agency responsibility.

Dixie Valley is an internally drained basin; that is, surface flows terminate in the basin rather than escaping the basin and flowing west to the Pacific Ocean (USACE 2002). In a report prepared by the USGS, Dixie Valley is described as a closed hydrologic unit (Cohen and Everett 1963). These descriptions are indicative that the basin lacks any hydrologic connectivity to rivers or other water bodies outside of the basin. Consequently, it is expected that there are no navigable waters of the United States within Rivers and Harbors Act jurisdiction (as defined by 33 CFR, Part 329) and no waters of the United States within CWA jurisdiction (as defined by 33 CFR, Part 328) in the Project Area.

The Dixie Hot Springs are located immediately adjacent to the geothermal lease areas (the springs are located in the SW¹/₄, SW¹/₄ of Section 28 and the SE¹/₄, SE¹/₄ of Section 29), and vegetation in a small portion of the geothermal lease areas is characterized as North American Arid West Emergent Marsh (see also Section 3.6, Vegetation and **Figure 6**, Surface Water).

In 2007, NAS Fallon conducted a wetland delineation in Dixie Meadows, on the US Navy land known as the Lamb Mineral interests on which Ormat owns the mineral rights. This area generally encompasses the Dixie Hot Springs complex. Wetland areas mapped during the study are comprised of the following habitat

categories: marshes, moist mixed grasslands (moist-saline meadows and flats), and woodlands; these features are shown on **Figure 6**, Surface Water (NAS Fallon 2008; US Navy GIS 2016) and are summarized below (NAS Fallon 2008).

Marshes are seasonally to semi-permanently flooded habitats dominated by grass-like plants; the most common being Baltic rush (*Juncus balticus*), bulrushes (*Scirpus* spp.), spikerushes (*Eleocharis* spp.), cattails (*Typha* spp.), and sedges (*Carex* spp.). Grasses, such as saltgrass (*Distichlis spicata*), are also present. Species in marshes are typical of Great Basin marsh habitats.

In the Cowardin system (Cowardin et al. 1979), marshes are classified as palustrine emergent wetlands that are at least seasonally flooded. Small shallow ponds surrounded by marsh vegetation are also included in this category. While vegetation is predominantly herbaceous, willows (*Salix* spp.), cottonwoods (*Populus fremontii*), or other woody species like tamarisk and Russian olive may be present as scattered individuals. The Dixie Hot Springs complex likely supplies a perennial water source for marsh wetlands in the Project Area.

Moist mixed grasslands are areas that are temporarily to intermittently flooded and typically support low-growing grasses that tolerate saline and seasonally saturated soils. Such habitats are commonly transitional between uplands and wetter areas such as marshes. Saltgrass meadows on playas also fall into this group. Typical vegetation is inland saltgrass (*Distichlis spicata* var. *stricta*) as a dominant or subdominant species.

Grasslands in Dixie Meadows range from nearly complete saltgrass cover, to areas co-dominated by other native grasses like creeping wildrye (*Elymus triticoides*) and Nevada bluegrass (*Poa secunda* ssp. *juncifolia*), with saltgrass at a much lower cover. These areas likely represent pockets of lower salinity soils (NAS Fallon 2008). Other species present are common sunflower (*Helianthus annuus*), sharp-pointed bulrush (*Scirpus pungens*), western niterwort (*Nitrophila occidentalis*), and iodinebush (*Allenrolfea occidentalis*). Under the Cowardin system, most moist mixed grasslands are classified as palustrine emergent wetlands that are unpredictably flooded for brief periods.

Woodlands are habitats with significant shrub or tree cover that range from temporarily to permanently flooded. Overstory vegetation is typical of Nevada's riparian areas; willows, Fremont cottonwood, tamarisk, Russian olive, and wild rose (*Rosa woodsia*) may be present. These areas are classified as palustrine scrub-shrub or forested wetlands, often with an emergent wetland understory.

A portion of the proposed northern gen-tie alignment crosses marshes, moist mixed grasslands, and North American Arid West Emergent Marsh as shown in **Figure 6**, Surface Water. These areas were delineated in 2007 on US Navy land only (NAS Fallon 2008). The proposed northern gen-tie alignment also crosses wetland areas located on BLM-administered land (T22N, R35E, section 4). However, specific wetland types are unknown, as no wetland delineation has

been completed on BLM-administered land. Approximately 0.5 miles (2,500 linear feet; Ormat GIS 2016; SWReGAP GIS 2005) of the proposed northern gen-tie alignment crosses North American Arid West Emergent Marsh, and an additional 0.7 miles (3,700 linear feet) crosses wetland areas as delineated in 2007 on US Navy lands or wetlands as mapped by the USFWS NWI on BLM-administered lands (Ormat GIS 2016; Navy GIS 2016; NWI GIS 2016; see **Figure 6**, Surface Water and **Table 17**, SWReGAP Landcover Types).

The Humboldt Salt Marsh, a playa, is located in the center of Dixie Valley and is traversed by a short length of the proposed northern gen-tie alignment. The playa is subject to inundation from seasonal runoff associated with snowmelt in surrounding mountain ranges during winter (Bryce et al. 2003). Consequently, the Humboldt Salt Marsh is considered an ephemeral wetland.

While the USACE may take jurisdiction over playas in general as “special aquatic sites,” the USACE is not expected to take jurisdiction over the Humboldt Salt Marsh, which does not abut and has no surface connection to Waters of the US. A salt crust covers most of the playa, and vegetation, hydrophytic or otherwise, is not present over most of the playa. Greasewood and saltgrass are typical salt-adapted species that grow in the vicinity of the gen-tie alignment crossing.

In 2014, a road was installed through a portion of the main Dixie Meadows hot spring wetlands to gain access to the existing 230-kV power transmission line connected to the Dixie Valley (Terra-Gen) Power Plant. The road dissected approximately half of the Dixie Meadows wetland area and resulted in the alteration of surface flow patterns that support surrounding and downstream wetlands, riparian areas, and associated aquatic habitat. The road was removed, and restoration is currently ongoing. A wetlands mitigation and monitoring plan was put in place to observe the hydrologic characteristics (temperature, wetted area, or vegetation) and to intervene if a negative change in habitat quality or quantity should occur. The road is still affecting surface flow patterns through a portion of the wetland area (Terra-Gen Dixie Valley 2015a; 2015b).

3.9.2 Environmental Consequences

Proposed Action (Northern Gen-tie Route)

The proposed gen-tie route crosses an area containing a series of springs and associated wetlands and riparian vegetation in T22N, R35E, Sections 4, 5, and 8 in the northern portion of Dixie Meadows. Approximately 6,200 linear feet of the gen-tie crosses North American Arid West Emergent Marsh, wetland areas as delineated in 2007 on US Navy lands, and wetlands on BLM-administered lands from the USFWS National Wetland Inventory (Ormat GIS 2016; SWReGAP GIS 2005; Navy GIS 2016; NWI GIS 2016). Surface disturbance from gen-tie construction would have direct impacts on these areas from vegetation damage or removal, and from soil compaction or disturbance. Additionally, surface disturbance during construction could increase erosion and

sedimentation to nearby springs and decrease groundwater infiltration and recharge rates. This could reduce wetland vegetation coverage in affected areas.

Mitigation measures for wetlands and riparian areas are as follows:

- ORNI 32 would develop and implement the Aquatic Resources Monitoring and Mitigation Plan. Implementing the plan would allow any direct and indirect adverse impacts on wetlands and riparian areas to be avoided, minimized, and mitigated as needed. This plan would be developed in coordination with the BLM, ORNI 32, and the cooperating agencies and finalized prior to a decision for the project.
- The project would be in compliance with BLM Manual 1737, Riparian-Wetland Area Management. There would be no net loss to wetlands or riparian areas that are a result of the Proposed Action.
- A wetland delineation would occur within Dixie Meadows, including on BLM- and US Navy-administered lands. This would allow sensitive resource areas to be delineated for appropriate buffers.
- Once delineation is complete, an appropriate surface disturbance avoidance buffer would apply to all wetland and riparian areas (see full lease stipulations in **Appendix A**). The buffer would ensure adequate protection of wetlands and riparian resources.
- Transmission towers would be sited to span identified wetland and riparian areas, as defined by the wetland delineation. String sites and other temporary work areas would be sited outside of identified wetland and riparian areas.
- Surface grading or vegetation clearing would not occur near springs, seeps, or sensitive resource areas as identified by the BLM from preconstruction surveys or the wetland delineation.
- Surface grading or vegetation clearing for gen-tie construction would occur only when absolutely necessary for safe access or installation of the conductors, and would only occur within the proposed ROW. If surface grading or vegetation removal is necessary within pre-identified wetland and riparian areas, ORNI 32 would notify and acquire authorization from the BLM Authorized Officer prior to project activity. Additionally, the BLM hydrologist and wildlife biologist would be on-site during associated activities to ensure adverse impacts on resources are minimized.
- Where access is necessary and no reasonable access roads exist, overland travel would be used to access the ROW. If overland travel is necessary within pre-identified wetland and riparian areas, ORNI 32 would notify and acquire authorization from the BLM Authorized Officer prior to project activity. Additionally, the BLM

hydrologist and wildlife biologist would be on-site during associated activities to ensure adverse impacts on resources are minimized.

- If overland travel were required in riparian or wetland areas, every effort would be made to limit overland travel to the late fall or early winter. This is when most plant and wildlife species are dormant and water levels are low.

The withdrawal of high-temperature groundwater from the geothermal reservoir during well testing could potentially reduce the volume or temperature, or alter water chemistry, of water at groundwater discharge points such as springs and seeps. This may indirectly impact wetland and riparian habitat by altering species composition or reducing wetland plant cover from reduced surface or subsurface water levels in wetland areas; however, the volume of fluid withdrawn during the relatively short duration well tests should be minor compared with the volume of fluid naturally available in the aquifers. Therefore, the impact of removal of geothermal fluids during testing would be anticipated to have only a short-term minor impact, if any at all.

Further, implementing the Aquatic Resources Monitoring and Mitigation Plan outlined in **Section 2.1.6**, would allow any impacts to be quickly identified and mitigated for.

All geothermal fluid produced during facility operations would be reinjected into the deep geothermal reservoir, maintaining the quantity of the geothermal resource. As a result, the overall impact on spring discharge and wetland plant cover from surface or subsurface water levels in wetland areas is expected to be small. To ensure that any potential impacts are identified, ORNI 32 would adhere to the Aquatic Resources Monitoring and Mitigation Plan outlined in **Section 2.1.6**. Measures in the plan include monitoring and collecting representative temperature, flow rate, groundwater level measurements, and specific water quality parameters from selected springs and groundwater monitoring wells.

If geothermal fluids or other chemicals (e.g., petroleum) were accidentally discharged, wetland or riparian habitat may be affected by plant mortality or reduced physiological function. To avoid this impact, ORNI 32 would comply with environmental protection measures in **Section 2.1.6**, including the Spill or Discharge Contingency Plan. Geothermal fluids would not be discharged to the ground under normal operating conditions. Accidental discharges of geothermal fluids are unlikely because of frequent inspections, ultrasonic testing of the pipeline, flow and pressure monitoring, and well pump and pipeline valve shutdown features, as outlined in **Section 2.1.6**.

Implementation of the Proposed Action could result in direct permanent and temporary impacts on playa habitats for installation of gen-tie towers, and permanent and temporary work areas associated with gen-tie construction. As

described in **Section 2.1.5**, permanent disturbance at each tower site would be limited to an approximately 2 to 3-foot diameter pole directly placed in the ground (approximately 7 square feet per pole), and two permanent maintenance areas measuring approximately 20 by 30 feet (600 square feet) at each pole location. Temporary work areas for each gen-tie tower could be up to 300 feet by 300 feet (approximately 2 acres) in size, though the flat and non-vegetated nature of the playa would likely mean that temporary work areas would be smaller. Temporary work areas would be located in previously disturbed areas, including the existing access road, to the extent possible. Environmental protection measures under the Proposed Action include limiting ground disturbance and reclaiming temporarily disturbed areas to promote the reestablishment of native plant and wildlife habitat. However, because playa habitat is naturally non-vegetated, vegetation would likely not be reestablished at these locations. A site reclamation plan describing interim and final reclamation would be developed and implemented prior to construction. Reclamation would be in conformance with reclamation standards outlined in Appendix D, Best Management Practices – Mitigation Measures, of the BLM's 2008 geothermal leasing PEIS (see **Appendix F** of this EA).

Gen-tie construction activities may have potential indirect impacts on playa habitat. Erosion would be minor because of the flat topography in the Project Area. Environmental protection measures detailed in **Section 2.1.6** include measures to avoid erosion and sedimentation, including minimizing soil disturbance, intercepting stormwater in ditches and energy dissipaters, maintaining access roads consistent with BMPs, and following BLM BMPs for stormwater on public lands. Construction activities on the playa would also be limited to dry periods when seasonal surface inundation is not present.

Indirect effects on wetland and playa habitat could also include potential for increased weed establishment and spread from soil disturbance during construction. Weed spread may alter habitat conditions, resulting in changes to hydrology and vegetation composition. Environmental protection measures outlined in **Section 2.1.6** would reduce potential for weed establishment and spread, including measures to minimize ground disturbance, prepare a weed management plan, and use weed-free seed in reclamation activities. As a result, the Proposed Action would have no net increase in the amount of weeds onsite during the life of the project.

Indirect impacts could also result from fugitive dust generated during construction that settles on wetland vegetation, reducing productivity. Environmental protection measures in **Section 2.1.6** include dust control measures during construction to minimize this impact.

In summary, direct and indirect significant adverse impacts on wetland or riparian habitat would be avoided, minimized, or mitigated. This would be due to surface occupancy restrictions in lease stipulations, implementation of

environmental protection measures and the Aquatic Resources Monitoring and Mitigation Plan outlined in **Section 2.1.6**.

Direct permanent and temporary impacts on playa habitat are expected, and though this area may be classified as an ephemeral wetland, the USACE is not expected to take jurisdiction over this area. Direct permanent and temporary impacts would be minimized by implementation of environmental protection measures outlined in **Section 2.1.6**. Additional potential indirect impacts on wetlands and playa habitat, including establishment and spread of weeds and deposition of fugitive dust, would be minimized or avoided by implementation of environmental protection measures outlined in **Section 2.1.6**.

Alternative 1 (Southern Gen-tie Route)

The nature and type of impacts under Alternative 1 would be similar to those described under the Proposed Action; however, there are no wetlands or riparian areas in the southern gen-tie route, so direct impacts on these areas are not anticipated under Alternative 1.

Alternative 1 would result in fewer acres of disturbance to playa habitats, as less playa habitat is located in the southern gen-tie alignment (see **Section 3.7**, Wildlife and Key Habitat). The southern gen-tie ROW crosses several ephemeral drainages that may flow into or near the cold springs and associated wetlands. These are in the southern portion of the Dixie Meadows area in T22N, R35E, Sections 18 and 19, between 1,700 and 2,100 feet from the southern gen-tie alignment. The springs supporting these wetlands are believed to be fed by groundwater, as opposed to surface recharge from ephemeral drainages. Because of this, impacts on spring flow to the wetlands is unlikely; however, erosion from ROW construction could increase sedimentation to wetlands, indirectly impacting wetland vegetation.

To avoid or minimize impacts, the construction site would be accessed via existing routes, to the extent possible. Where access is necessary and no reasonable access roads exist, ORNI 32 would use overland travel to access the ROW. Surface grading or vegetation clearing for gen-tie construction would occur only when necessary for safe access or for installing the conductors and only in the proposed ROW. Any surface disturbance would comply with BLM BMPs.

Surface occupancy restrictions in lease stipulations, environmental protection measures, and implementation of the Aquatic Resources Monitoring and Mitigation Plan and their associated impacts under Alternative 1 are the same as those described under the Proposed Action.

No Action Alternative

Under the No Action Alternative, the BLM would not approve the Proposed Action, the facilities would not be constructed, and ORNI 32 would likely suspend exploration activities authorized under the two previous Decision

Records for the foreseeable future. As such, there would be no change in existing wetland or riparian conditions at the site.

3.10 INVASIVE, NONNATIVE, AND NOXIOUS WEED SPECIES

The Federal Noxious Weed Act of 1974 provides for the control and management of nonindigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health. The act prohibits importing or moving any noxious weeds identified by the regulation and allows for inspection and quarantine to prevent the spread of noxious weeds.

Signed in 1999, Executive Order 13112 directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause. To do this, the executive order established the National Invasive Species Council; currently there are 13 departments and agencies on the council.

The Noxious Weed Control and Eradication Act (Public Law 108-412) of 2004 requires the Secretary of Agriculture to establish a program to assist eligible weed management entities to control or eradicate noxious weeds on public and private land.

3.10.1 Affected Environment

The state of Nevada lists 47 noxious weed species that require control (Nevada Administrative Code 555.10). Of these, five have been observed in the Project Area during biological surveys: tamarisk (*Tamarix ramosissima*), tall whitetop (*Lepidium latifolium*), Russian knapweed (*Acroptilon repens*), hoary cress (*Cardaria draba*), and Russian olive (*Elaeagnus angustifolia*; EMPSi 2016; ESRS 2013).

Tamarisk was observed in several locations within the greasewood flat vegetation community, along the proposed northern gen-tie line and in the vicinity of the proposed power plant locations. Several patches of tall whitetop were observed along the both gen-tie alignments. Two Russian olive trees and a few hoary cress individuals were observed in the Dixie Springs area. Russian knapweed was observed along the northern gen-tie alignment through the Jersey Valley, where several thousands of plants exist in several discrete and dense patches within annual grassland. A small disused reservoir or holding pond in the vicinity of the Jersey Valley Hot Springs, near the northern terminus of the northern gen-tie line, contains a dense infestation of Russian knapweed, tall whitetop, and hoary cress.

Additional invasive, nonnative plant species observed in the Project Area include cheatgrass (*Bromus tectorum*), halogeton (*Halogeton glomeratus*), bur buttercup (*Ceratocephala testiculata*), and clasping pepperweed (*Lepidium perfoliatum*).

3.10.2 Environmental Consequences

Proposed Action (Northern Gen-tie Route)

The Proposed Action has the potential to increase the spread of noxious weeds and invasive, nonnative plants. Weed seeds can germinate when soils are disturbed by construction activities, particularly where available soil moisture is increased by application of water for dust suppression. Weeds could also be introduced by construction equipment brought to the project from infested areas or by using seed mixtures or mulching materials containing weed seeds.

The potential for the Proposed Action to increase the spread of noxious weeds and invasive, nonnative plants would be minimized by environmental protection measures as described in **Section 2.1.6**, including preparation of an invasive plant management plan prior to construction, minimizing surface disturbance during construction, and using native, weed-free seed during restoration of temporarily disturbed areas.

Alternative I (Southern Gen-tie Route)

The nature and type of impacts under Alternative I would be similar to those described under the Proposed Action. However, Alternative I would result in 10 fewer acres of soil disturbance, slightly reducing the potential for noxious weed and invasive, nonnative plant establishment and spread.

Regardless of the gen-tie line routing option chosen under Alternative I, impacts on noxious weeds and invasive, nonnative plants from either routing option would be the same.

Environmental protection measures and their associated impacts under Alternative I are the same as those described under the Proposed Action.

No Action Alternative

Under the No Action Alternative, the BLM would not approve the Proposed Action, the facilities would not be constructed, and ORNI 32 would likely suspend exploration activities authorized under the two previous Decision Records for the foreseeable future. As such, existing trends for noxious weeds and invasive, nonnative plants would continue.

3.11 VISUAL RESOURCES

3.11.1 Affected Environment

Section 102(a)(8) of the FLPMA establishes the policy that public lands be managed in a manner that would protect the quality of scenic values (43 USC, Subsection 1701(a)(8)). To meet this responsibility, the BLM uses the visual resource management (VRM) system (BLM Manual 8400, Manual H-8410-1, and Manual H-8431).

The BLM initiated the VRM process to manage the quality of landscapes on public lands and to evaluate the potential impacts on visual resources resulting from development activities. The VRM system addresses different levels of scenic values, which require different levels of management. The BLM uses four unique VRM classes to assess scenic values and visual impacts. VRM Class I is the most restrictive towards landscape alteration and development activities, and VRM Class IV is the least restrictive (BLM 2007c).

VRM classes are utilized to identify minimum levels to the visual resource when a proposed development action is analyzed using the BLM's Visual Resource Management Inventory and Contrast Rating Manuals 8410-1 and 5432-1.1. By using this system, the impact magnitude on 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 (BLM 2012a).

The characteristic landscape of the Project Area is dry and arid desert, with the Stillwater Mountain Range and central Nevada desert surrounding the proposed project site and gen-tie line.

Sensitive receptors in the Project Area include people recreating in the area. Recreational activities can include hiking, bird watching, nature photography, mountain biking, and OHV use.

Visual Contrast Rating

The degree to which a project adversely affects the visual quality of a landscape relates directly to the amount of visual contrast between it and the existing landscape character. The degree of contrast is measured by separating the landscape into major features (land, water, vegetation, and structures) then assessing the contrast introduced by the project in terms of the basic design elements of form, line, color, and texture (BLM Manual 8431, Visual Contrast Rating).

The degree of contrast introduced by a proposed project with landscape elements is then rated as none, weak, moderate, or strong as shown in **Table 20**, Degree of Contrast Rating. The purpose of this method is to reveal elements and features that cause the greatest visual impact, and to guide efforts to reduce the visual impact of a proposed action or activity. This process is described in detail in Handbook H-8431-1, Visual Resource Contrast Rating, and documented using BLM Form 8400-4, Visual Contrast Ratings Worksheets, a map depicting KOP locations, and photograph logs for the potential impacts the proposed project may have on visual quality are provided as **Appendix E**, KOP Locations, Visual Contrast Rating Worksheets, and Photo Logs.

Table 20
Degree of Contrast Rating

Degree of Contrast	Criteria	Conformance with VRM Class
None	The element contrast is not visible or perceived	VRM Class I-IV
Weak	The element contrast can be seen but does not attract attention	VRM Class II-IV
Moderate	The element contrast begins to attract attention and begins to dominate the characteristic landscape	VRM Class III-IV
Strong	The element contrast demands attention, will not be overlooked, and is dominant in the landscape	VRM Class IV only

Source: BLM Handbook H-843I-I, Visual Resource Contrast Rating

Key Observation Points

Five key observation points (KOPs) were chosen for visual contrast rating analysis, as summarized in **Table 21**, Key Observation Points. KOP locations are shown in **Appendix E**.

From each KOP, the viewshed can be divided into three distinct distance zones: the foreground, mid-ground, and background, as summarized in **Table 22**, Key Observation Point Viewsheds.

Table 21
Key Observation Points

KOP #	Location	Distance from Project	Comments
KOP 1	Point along Dixie Valley Road	Approximately 5 miles south-southwest of power generation plants. 800 feet west of southern gen-tie.	Provides the first distant view of the proposed plants for motorized travelers heading north from Hwy 50 on Dixie Valley Road.
KOP 2	Point along Dixie Valley Road	Approximately 0.5 miles south-southwest of power generation plants.	Provides representative view of power generation plants from Dixie Valley Road near plants, traveling north.
KOP 5	Point along Dixie Valley Road	Approximately 0.5 miles north of power generation plants.	Provides representative view of power generation plants from Dixie Valley Road near plants, traveling south.

Table 21
Key Observation Points

KOP #	Location	Distance from Project	Comments
KOP 6	Point along Dixie Valley Road	Approximately 2.5 miles northeast of power generation plants and 750 feet north of northern gen-tie.	Provides representative view of the new northern gen-tie line as it parallels existing transmission line.
KOP 8	Point along Dixie Valley Road	Approximately 16 miles northeast of power generation plants and 750 feet north of northern gen-tie.	Provides representative view of the new northern gen-tie where not paralleling existing transmission line.

Table 22
Key Observation Point Viewsheds

KOP #	Foreground	Mid-ground	Background
KOP 1	Open, relatively smooth, flat, slightly concave valley floor sloping east. Vegetation is composed primarily of indistinct mixed salt desert scrub, which is low, uniform, and continuous with predominate colors of yellows, grays, light tans or browns, and seasonal greens.	Same as foreground.	Rugged terrain comprised of the flanking ranges. Ridges and canyons and pyramidal, angular shapes provide dark and light contrasts from shadows and exposed rock coloration. Colors are dark browns, reds, and grays.
KOP 2	Open, relatively smooth, flat, slightly concave valley floor sloping east toward the Humboldt Salt Marsh. Vegetation is indistinct mixed salt desert scrub, which is low and even but discontinuous with predominate colors of yellow, grays, light tans or browns, and occasional greens.	Humboldt Salt Marsh, an unvegetated playa feature in the topographic low of the valley.	Rugged terrain of the Clan Alpine Range comprised of ridges and canyons and pyramidal, angular shapes that provide dark and light contrasts from shadows. Predominant colors are dark browns and grays.

Table 22
Key Observation Point Viewsheds

KOP #	Foreground	Mid-ground	Background
KOP 5	Open, relatively smooth, flat, slightly concave valley floor sloping east toward the valley floor. Vegetation indistinct mixed salt desert scrub, which is low and even but discontinuous with predominate colors of yellow, grays, light tans or browns, and occasional green.	Similar to foreground; partially obscured by mineral materials development.	Rugged terrain of the Stillwater Range comprised of ridges and canyons and pyramidal, angular shapes that provide dark and light contrasts from shadows. Predominant colors are dark browns and grays.
KOP 6	Open, relatively smooth, flat, slightly concave valley floor. Vegetation is composed primarily of indistinct mixed salt desert scrub, which is low, uniform, and continuous with predominate colors of yellow, grays, light tans or browns, and seasonal greens.	Same as foreground.	Rugged terrain comprised of the Stillwater Range. Views are of small ridges and canyons and pyramidal, angular shapes that provide dark and light contrasts from shadows and exposed rock coloration. Predominant colors are dark browns, reds, and grays.
KOP 8	Nearly flat valley floor, which is open and relatively smooth. Vegetation indistinct mixed salt desert scrub, which is low, uniform, and continuous with predominate colors of yellow, grays, light tans or browns, and seasonal greens.	Open, smooth, slightly concave valley center. Vegetation indistinct mixed salt desert scrub, which is low, uniform, and continuous with predominate colors of yellow, grays, light tans or browns, and seasonal greens.	Rugged terrain comprised of the Clan Alpine Range. Views are of small ridges and canyons and pyramidal, angular shapes that provide dark and light contrasts from shadows and exposed rock coloration. Predominant colors are dark browns, tans, and grays.

The proposed project would occur in an area where no VRM classes have been established (BLM GIS 2016). When no VRM classes exist, the CCD CRMP standard operating procedures state that an interim VRM objective is to be assigned at the time a project is proposed. The VRM objectives are to be

developed using the guidelines established in BLM Manual H-8410-1 and must conform to land use allocations set forth in the CCD CRMP.

A visual resources inventory was conducted, and the current management activities in the area were assessed. The Project Area and surrounding lands are recommended as interim VRM Class III objective to allow for management decisions consistent with the resource allocations for the area. The VRM Class III objective 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 (BLM 2012a). Since the primary resource use within the Project Area is grazing and energy development, establishing an interim VRM Class III objective would be in compliance with current guidelines and policy for VRM.

3.11.2 Environmental Consequences

Proposed Action (Northern Gen-tie Route)

The Proposed Action for visual resources is to establish interim VRM objectives for the Project Area until such time as permanent objectives are designated in the ongoing Carson City District Resource Management Plan revision (Carson City RMP). Once the Carson City RMP is final, the management decision regarding VRM would supersede the interim VRM objectives established through this EA should they vary.

The visual contrast rating analysis for all five KOPs found the project components would be visible and create a contrast with the surrounding landscape. The predominant vegetation is under 3 feet in height and would not provide screening of the project. The horizon line would be broken and discontinuous from most KOPs, thereby reducing contrasting impacts on the landscape lines and form, since power lines and facilities would generally not protrude above the skyline. However, from some KOPs, project components would protrude above the skyline where it is relatively low in elevation. The project would extend existing visual disturbances and introduce additional elements into the landscape. However, non-natural features to line and form are already present from the existing utility poles and lines, Dixie Valley Road, mineral materials development site, other man-made structures, fence lines, and other areas with exposed natural sediment.

Temporary impacts on visual resources would occur during the 12 to 24-month construction period for the power plants, gen-tie, and ancillary facilities. Heavy equipment, including large tractor-trailer trucks, would be present on-site. Equipment laydown would be located in previously disturbed areas.

Drilling equipment would be seen from Dixie Valley Road. Roads, drill pads, and laydown areas are near ground level and would not affect visual resources.

During the approximately 45-day drilling process for each exploration well, the top of the drill rig would be up to 170 feet above the ground surface, depending on the drill rig used. During drilling operations, the rig would be visible at distances of greater than 1 mile from the respective drill sites, and lights used when drilling at night would increase rig visibility. All drill rig and well test facility lights would be limited to those required to safely conduct the operations and would be shielded and/or directed in a manner that focuses direct light to the immediate work area.

Equipment used for construction of a portion of the gen-tie route would be visible from Dixie Valley Road. Construction impacts would be minor and short-term and would be consistent with VRM Class III objectives.

Long-term impacts would include up to approximately 122 acres of surface disturbance from the construction of the gen-tie line, power plants, and ancillary facilities that would not be reclaimed following construction. All newly constructed structures would be below 85 feet tall and the power plants, pipelines, wellheads, pump motors and motor control buildings would each be painted consistent with BLM visual guidelines to blend with the area and minimize visibility. The fence constructed around each of the production well sites would also be painted an appropriate color to blend with the area.

The gen-tie would generally parallel existing roads and/or transmission lines. Gen-tie towers would be 55 to 70 feet high and would be visible to travelers on Dixie Valley Road.

In sum, the facilities constructed for the Proposed Action would be noticeable to sensitive receptors but would not dominate their view. As such, their impact on the characteristic landscape would be moderate. As the degree of contrast and modification imposed on the landscape by the project would fall within the parameters of VRM Class III objectives, the project would be in conformance with VRM guidelines and policy. Further, as installation of the prescribed lighting types along with properly shielded lighting would limit light pollution into the natural darkness of the high desert environment, these mitigations would limit lighting impacts on the Nevada “dark skies” as well as limit light pollution impacts on local wildlife populations.

Alternative 1 (Southern Gen-tie Route)

Impacts on visual resources would be similar to those under the Proposed Action. Construction and operation of the southern gen-tie would be consistent with VRM Class III objectives. Long-term impacts would include up to approximately 112 acres of surface disturbance (including the power plant[s] and ancillary facilities). The 230-kV towers would be up to 100 feet tall, but they would parallel the existing Oxbow transmission line, thus limiting changes to the characteristic landscape. Gen-tie towers and the transformer site would be visible to travelers on Dixie Valley Road.

In sum, the facilities of Alternative I would be noticeable to sensitive receptors but would not dominate their view. As such, their impact on the characteristic landscape would be moderate. As the degree of contrast and modification imposed on the landscape by the project would fall within the parameters of VRM Class III objectives, the project would be in conformance with VRM guidelines and policy. Further, as installation of the prescribed lighting types along with properly shielded lighting would limit light pollution into the natural darkness of the high desert environment, these mitigations would limit lighting impacts on the Nevada dark skies and would limit light pollution impacts on local wildlife populations.

No Action Alternative

Under the No Action Alternative, the BLM would not approve the Proposed Action, the facilities would not be constructed, and ORNI 32 would likely suspend exploration activities authorized under the two previous Decision Records for the foreseeable future. As such, there would be no change in existing visual resource conditions at the site.

3.12 CULTURAL RESOURCES

3.12.1 Affected Environment

Cultural resources include historic and prehistoric sites and may include structures, archaeological sites, or religious sites of importance to Native American cultures. Archaeological and historic resources are defined as follows:

...the physical evidences of past human activities, including evidences of the effects of that activity on the environment. Factors identifying age, location and context of a site may make it culturally significant when looked at in conjunction with its capacity to reveal information through the investigatory research designs, methods, and techniques used by archaeologists (NPS 1998).

Ethnographic resources are defined as follows:

[Any]...site, structure, landscape, object or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it (NPS 1998).

The NHPA of 1966, as amended, and the Archaeological Resources Protection Act of 1979 (ARPA) are the primary laws regulating preservation of cultural resources. Section 106 of the NHPA requires federal agencies to take into account the effects of their actions on properties listed or eligible for listing on the National Register of Historic Places (NRHP). Regulations codified in 36 CFR, Part 800 define how eligible properties or sites are to be dealt with by federal agencies or other involved parties. These regulations apply to all federal undertakings and all cultural resources. The ARPA sets a broad policy that

archaeological resources are important to the nation, as well as locally and regionally, and should be protected. The purpose of the ARPA is to secure the protection of archaeological resources and sites that are on public lands and Native American lands. The law applies to any agency that receives information that a federally assisted activity could cause irreparable harm to prehistoric, historic, or archaeological data and provides criminal penalties for prohibited activities.

Additionally, in the State Protocol Agreement Between the Bureau of Land Management, Nevada and the Nevada State Historic Preservation Office (Protocol), the BLM would ensure that historic properties that may be affected by any undertaking are identified and evaluated in accordance with the procedures established in Section 5.A. These include conducting an inventory for all archaeological resources within the area of potential effect (APE). In accordance with the Protocol, the BLM agreed to take into consideration potential traditional cultural properties (TCP) within the APE.

Section 5.B.5 of the Protocol states the following:

Provisions for evaluation extend to properties of religious and cultural significance to Indian tribes. The BLM Manager makes eligibility determinations based on consultation with affected Indian tribes and on recommendations made by CRSs. BLM also acknowledges that Indian tribes possess special expertise in assessing the eligibility of historic properties that may possess religious and cultural significance. BLM's consultation process should follow the latest Manual and associated Handbook, as well as appropriate Information Memoranda and Information Bulletins relaying guidance on tribal consultation protocols from the Washington Office or NSO.

In order to identify archaeological historic properties within the Project Area, Ormat contracted Western Cultural Resource Management (WCRM) to conduct a cultural resource inventory. Between August 16 and 25, 2011; September 27 and October 6, 2011; and June 19 and 28, 2012; archaeologists from WCRM conducted a Class III cultural resource inventory of approximately 3,239 acres for the project on lands administered by the CCD Stillwater Field Office (1,835 acres) and the Winnemucca District Office (WDO; 1,303 acres), on US Navy land (100 acres), and on 1 acre of private land (WCRM 2014).

The inventory resulted in the identification and documentation of 40 previously undocumented archaeological sites and the documentation of 57 isolated finds. Of the newly documented sites, 24 are prehistoric, 12 are historic, and 4 are multicomponent. Additionally, 14 previously recorded sites were revisited during this project and 6 were updated. The six updated sites are: 26Ch577/CrNV-03-1112, 26Ch1988/CrNV-03-4513, 26Ch2597/CrNV-03-7317, 26Ch3231/CrNV-03-8080, 26Ch3236/CrNV-03-8085, and 26Pe3460/CrNV-21-8700. These sites consist of two lithic scatters (26Ch2597 and 26Ch577), three

historic roads (26Ch3231, 26Ch3236, and 26Pe3460), and a lithic scatter with an isolated historic can (26Ch1988).

Three of the previously recorded sites (26Ch577/CrNV-03-1112, 26Ch1988/CrNV-03-4513, and 26Ch2597/CrNV-03-7317) had been previously determined eligible for inclusion on the NRHP, and the BLM determined that these sites retain their eligibility. Of the newly documented sites, five are recommended eligible to the NHRP and three are recommended as unevaluated.

On November 7, 2014, the BLM CCD submitted for SHPO review the subject document (8110/LLNVC0100/CRR3-2597[P]; SHPO Undertaking 2015-3448 #19762). At that time, in accordance with Section 5.A., the BLM CCD inventoried all archaeological resources within the APE. It also sought SHPO concurrence for NRHP eligibility for 36 recorded sites that the BLM CCD recommended as ineligible for inclusion on the NRHP and that it determined no further action was necessary. Additionally, the BLM CCD requested SHPO concurrence on the eligibility determination of the 11 sites and stated no cultural resources or historic properties would be impacted by the undertaking.

In a letter dated January 6, 2015, SHPO concurred with the BLM CCD determination that the 36 sites are not eligible for NRHP listing. It also concurred with the BLM CCD's determination of eligibility of the 11 sites.

In accordance with Section 5.A.4 of the Protocol, the BLM CCD sought to identify ethnographic resources and TCPs. The BLM CCD has identified the Dixie Meadows Hot Spring site as an ethnographic resource and potentially a TCP. It based this on tribal consultation with the Fallon Paiute-Shoshone Tribe (FPST; see **Section 3.13**, Native American Religious Concerns) and an ethnography that took into consideration potential TCPs within the APE (Ethnographic Synthesis and Context for the Carson City District Office, BLM, NV [CRR 3-2653]),

3.12.2 Environmental Consequences

Proposed Action (Northern Gen-tie Route)

Any surface-disturbing activities during exploration and construction of the well pads, power plant, gen-tie lines, pipelines, roads, parking, and laydown areas could have direct impacts on cultural resources. Examples are damaging, destroying, or displacing artifacts and features and construction of modern features out of character with a historic setting. Damaging, displacing, or destroying cultural or ethnographic resources could include removing artifacts from their situational context; breaking artifacts; shifting, obliterating, or excavating features without appropriate scientific recording; and destroying or reducing natural or cultural features that contribute to and are considered an ethnographic resource or TCP.

Indirect impacts on cultural resources would include changing the character of the property's use or physical features in the property's setting and introducing visual, atmospheric, or audible elements that diminish the integrity of the property's features.

A geothermal plant, well pads, and associated facilities construction would place modern features onto a landscape that did not have them previously. This would thereby juxtapose modern industrial features onto a historic landscape. ORNI 32 would avoid any areas containing cultural resources of significance, including unevaluated sites and all historic properties that have been recommended as eligible for listing on the NRHP. Also, a buffer of approximately 30 to 50 meters (100 to 165 feet) would be established around eligible and unevaluated cultural sites that lie close to project activities.

When construction is close to the buffered areas, at least one archaeological monitor and one tribal monitor would be present to ensure that eligible and unevaluated cultural sites are not disturbed. If previously unrecorded cultural resources are encountered during surface-disturbing activities, such activities would cease within 100 meters (330 feet) of the discovery, and the BLM would be notified.

Further, ORNI 32 employees, contractors, and suppliers would be reminded that all cultural resources are protected and if uncovered must be left in place and reported to the ORNI 32 representative or their supervisor (or both), as described in **Section 2.1.6**.

Coordination between the BLM, ORNI 32, and WCRM during project development resulted in rerouting the proposed project components to avoid impacting these historic properties. Following rerouting components and implementation of environmental protection measures described in **Section 2.1.6**, this project should have no adverse impacts on archaeological historic properties (36 CFR, Subpart 800.4). All sites determined not eligible for listing on the NRHP do not require further treatment.

However, under Section 5.B.5 of the Protocol, the BLM is treating the Dixie Hot Springs Site (CrNV-03-E0286) as eligible under all four criteria of the NRHP (criteria A, B, C, D). The BLM CCD has also determined a finding of adverse effect on CrNV-03-E0286 and is requesting SHPO concurrence for that determination. (See **Section 3.13**, Native American Religious Concerns for additional discussion and analysis for this site.)

Alternative 1 (Southern Gen-tie Route)

Impacts would be the same as described under the Proposed Action.

No Action Alternative

Under the No Action Alternative, the BLM would not approve the Proposed Action, the facilities would not be constructed, and ORNI 32 would likely

suspend exploration activities authorized under the two previous Decision Records for the foreseeable future. As such, there would be no adverse effect on any of the recorded or possibly buried cultural resources.

3.13 NATIVE AMERICAN RELIGIOUS CONCERNS

3.13.1 Affected Environment

An integral part of the NEPA scoping process includes coordination between federal agencies and those groups who may be affected by a proposed federal action. According to the Protocol, the BLM would ensure that historic properties that may be affected by any undertaking are identified and evaluated in accordance with the procedures established in Section 5.A. These include conducting an inventory for all archaeological resources within the APE. In accordance with Section 5.A.4 of the Protocol, the BLM-NV agreed to take into consideration potential TCPs within the APE.

Section 5.B.5 of the Protocol states the following:

Provisions for evaluation extend to properties of religious and cultural significance to Indian tribes. The BLM Manager makes eligibility determinations based on consultation with affected Indian tribes and on recommendations made by CRSs. BLM also acknowledges that Indian tribes possess special expertise in assessing the eligibility of historic properties that may possess religious and cultural significance. BLM's consultation process should follow the latest Manual and associated Handbook, as well as appropriate Information Memoranda and Information Bulletins relaying guidance on tribal consultation protocols from the Washington Office or NSO.

Toward this end, the BLM has initiated coordination and consultation with Native American tribal representatives in the Project Area. This process has provided tribal entities the opportunity to identify potential effects of the project on Native American interests. This section describes the coordination process between the BLM and Native Americans, identifies the Native American resource areas of interest, as well as the project's potential effects on Native American concerns. Also included are recommended mitigation measures to avoid or reduce potential impacts on Native American concerns.

Consultation with the Fallon Paiute-Shoshone Tribe was initiated through a face-to-face meeting between Ms. Terri Knutson, BLM CCD, Stillwater Field Manager, and the Fallon Paiute-Shoshone Tribal Council, including Alvin Moyle, Tribal Chairman, on August 25, 2010. A summary and timeline of project activity and consultation dates are as follows:

- Consultation between the FPST and the BLM CCD for geothermal projects in Dixie Valley began on April 13, 2007. The geothermal lease parcels surrounding Dixie Meadows were analyzed for the

Competitive Geothermal Lease August Sale (DNA/2002EA-NV-030-02-021) and a consultation letter was sent to the FPST.

- Formal government-to-government consultation between the BLM CCD and the FPST for geothermal exploration phase projects was initiated through a face-to-face meeting on August 25, 2010. Subsequent meetings were conducted October 26, 2010, and April 27 and July 28, 2011. Additional in-person meetings between BLM and FPST staff for the exploration phase were held on September 15 and December 22, 2010; May 25, 2011; March 3, 2010; May 25, 2011; and May 23, 2013. Field trips to Dixie Hot Springs with FPST staff for the development phase were conducted on March 25 and April 10, 2015, and March 26, 2016.
- Formal consultation with the Nevada SHPO for the project began November 7, 2014.
- Project initiation for Ormat's geothermal development project was held by BLM CCD staff on June 22, 2015. A field trip to Dixie Meadows and the project location was conducted with BLM SWFO staff, BLM SWFO Field Manager, and BLM CCD Manager on April 28, 2016.
- On June 24, 2015, a consultation initiation letter was provided to FPST Chairman Len George. The letter included a description of the proposed project, a map of the project location, and an invitation for comments or feedback regarding the project. An additional information request letter was sent to FPST Chairman George on February 12, 2016, when BLM CCD staff received the draft EA.
- During a formal consultation meeting with the FPST Council on Tuesday, September 13, 2016, the BLM CCD provide to the tribe a document containing consultation results and also provided the tribe with a mitigation plan to address concerns.
- On September 28, 2016, a formal consultation meeting was conducted between member of FPST Council, members of the FPST Cultural Committee, BLM CCD and a representative from Ormat. This resulted in a request by FPST Council to meet with BLM NV State Director John Ruhs and BLM CC District Manager Ralph Thomas. The FPST Council also formally supported the FPST Cultural Committee concerns about the Project.

In accordance with Section 5.A.4 of the Protocol, the BLM CCD sought to identify ethnographic resources and TCPs within the APE. It referred to an ethnographic study that included the Project Area, titled *Ethnographic Synthesis and Context for the Carson City District Office, BLM, NV [CRR 3-2653]*. This study involved the following:

- Research of published ethnographies and history and unpublished archives
- Interviews with ethnographers and agency personnel with experience in the area
- A series of meetings and interviews with Western Shoshone and Northern Paiute tribal representatives
- Presentations to tribal councils
- Focused interviews and field trips with individuals especially knowledgeable about the history of land use and traditions associated with the Project Area

Meetings and interviews were open-ended but guided by the research questions. They focused on identifying historic properties and potential traditional cultural properties. The study included three tasks: identifying primary contacts, identifying issues and potential properties and areas of concern, and reporting the results. The resulting collaborative report (Tiley 2013) was based on the observations of the cultural specialists and identified sites potentially eligible as Western Shoshone/Northern Paiute historic properties and as TCPs. It used these as a basis for identifying potential effects from the project and to propose mitigation.

The BLM CCD has determined that Dixie Hot Springs is an ethnographic resource and has potential as a TCP. The CCD has recorded the site on an ethnography form (CrNV-03-E0286).

In making this determination, the BLM followed National Register Bulletin 38, Guidelines for Evaluating and Documenting Traditional Cultural Properties. In order to meet the definition of a TCP, the BLM paid particular attention to the following three guidelines:

- Is the property rooted in Western Shoshone/Northern Paiute History?
- Is the property important to maintain Western Shoshone/Northern Paiute traditional beliefs and practices?
- Has the property been used for the past 50 years or longer?

The BLM CCD believes that Dixie Meadows meet these criteria.

Dixie Hot Springs has been used by the FPST as a traditional ceremonial and healing place for well over 50 years. The FPST continue to use the hot springs for ceremonial and healing purposes. The FPST identify Dixie Hot Springs as a sacred locality and one which they consider important to maintaining Western Shoshone/Northern Paiute cultural beliefs and practices.

Ethnobiotic resources found at Dixie Hot Springs continue to play an important part in maintaining cultural traditions. Plants containing medicinal properties are dispersed in or near the Project Area and are important in maintaining the cultural identity of the FPST. The types and locations of these medicinal plants are confidential and are known only to the FPST (Tiley 2013). Some medicinal plants are locally abundant, while others may be rare.

3.13.2 Environmental Consequences

Proposed Action (Northern Gen-tie Route)

This section identifies the project's potential effects on Native American concerns and provides mitigation measures to eliminate or reduce their effects.

In accordance with Sections 5.A.4 and 5.B.5 of the Protocol, the BLM CCD is treating the Dixie Hot Springs Site (CrNV-03-E0286) as eligible under all four criteria of the NRHP (criteria A, B, C, D). The BLM CCD has also determined a finding of adverse effect on CrNV-03-E0286, based on the project's potential effects.

The project would have a significant adverse effect on Native American concerns if it were to result in one the following:

- Prevent access to the ethnobiotic resources or to the Dixie Hot Springs
- Reduce or alter the temperature of the water at Dixie Hot Springs
- Reduce the flow of water at Dixie Hot Springs
- Reduce the ethnobiotic resources at Dixie Hot Springs, such that the resource area would be adversely impacted by the construction, operation, or maintenance of the power plant or the transmission line

It is possible that the construction, operation, and maintenance of the project may disturb or destroy the flow rate, temperature, chemical composition, or other relevant factors in determining the health of the Dixie Hot Springs. Moreover, these actions may adversely disturb or destroy culturally-important medicinal plants.

Archaeological resources that may be related to ethnographic resources or TCPs would be avoided (see **Section 3.12**, Cultural Resources). Preliminary discussion regarding mitigation and treatment of CrNV-3-E0286 has begun between the BLM CCD, the FPST, and ORNI 32. As part of the proposed mitigation, the BLM CCD would develop a more fully formed narrative and evaluation of the site's eligibility as a TCP. The completed recordation, mitigation, and treatment of adverse impacts on CrNV-03-E0286 would be formalized in a Memorandum of Agreement between the BLM, SHPO, FPST and

ORNI 32. The BLM CCD or other qualified professionals would follow the National Register Bulletin 38, Guidelines for Evaluating and Documenting Traditional Cultural Properties.

The BLM has proposed mitigation for potential adverse impacts on traditional medicinal plants. Through consultation with Fallon Paiute-Shoshone Tribe traditionalists knowledgeable about the location of traditional medicinal plants, rare medicinal plant locations have been identified and will remain confidential. These locations will be field-checked by the BLM and by designated Fallon Paiute-Shoshone Tribe members. Locally abundant or widespread medicinal plants will not require field-checking. The project has been designed to avoid rare medicinal plants that have been identified. Other measures, such as permanent protective fencing, may also be required for avoidance.

Construction, operation, and maintenance of the project may prevent access to traditional gathering or traditional use sites. To avoid this impact, the BLM would not authorize any closing of access roads related to this project. The BLM would maintain public access to the important traditional use/gathering sites. Additionally, trail access to sites would be improved so elderly members of the public can more easily access the sites.

Geothermal development could alter the flow or temperature of springs important to the traditional cultural lifeways of the Fallon Paiute-Shoshone Tribe. To avoid this impact, ORNI 32 would comply with all measures to avoid impacts on water resources as outlined in **Section 2.1.6**, Environmental Protection Measures, and as discussed under **Section 3.3**, Water Resources.

Alternative 1 (Southern Gen-tie Route)

Impacts would be the same as described under the Proposed Action.

No Action Alternative

Under the No Action Alternative, the BLM would not approve the Proposed Action, the facilities would not be constructed, and ORNI 32 would likely suspend exploration activities authorized under the two previous Decision Records for the foreseeable future. As such, there would be no impact on Native American resources.

3.14 TRAVEL MANAGEMENT

3.14.1 Affected Environment

As described in **Section 2.1.4**, primary site access is by driving about 40 miles east from Fallon on US Highway 50 and then north on State Highway 121 (Dixie Valley Road) for approximately 36 miles. The road is mostly used to access ranches, military installations, and the Terra-Gen Dixie Valley Geothermal Power Plant.

Roads in the immediate project vicinity include the Dixie Valley Road and a network of smaller unpaved roads on BLM-administered land. Road uses include motorized recreation, access to hunting areas, and administrative and permitted use. The Project Area has not been formally designated as open, closed, or limited for motorized travel and is managed like an “open” OHV area, meaning cross-country travel is allowed.

3.14.2 Environmental Consequences

Proposed Action (Northern Gen-tie Route)

Construction could temporarily conflict with public access along roads in the Project Area. Specifically, vehicles may be delayed during construction of the gen-tie where it parallels existing roads. Access may also be affected by the number of construction vehicles traveling to and from the site, especially if larger and heavier vehicles are traveling at slower speeds. Construction would not restrict access to other areas (e.g., the VSA and the northern Dixie Valley area); no existing access roads would be closed.

Due to the small number of vehicles needed for operation, there would be no long-term impacts on travel management.

Alternative 1 (Southern Gen-tie Route)

Impacts would be the same as under the Proposed Action.

No Action Alternative

Under the No Action Alternative, the BLM would not approve the Proposed Action, the facilities would not be constructed, and ORNI 32 would likely suspend exploration activities authorized under the two previous Decision Records for the foreseeable future. As such, there would be no impact on travel management.

3.15 LAND USE AUTHORIZATIONS

3.15.1 Affected Environment

There are several ROWs located within one mile of the proposed project site and the proposed gen-tie line. Types of ROWs include transmission and communication lines, roads, a seismic station site, and water monitoring wells. In addition, the geothermal lease area also contains mineral rights to 760 acres of US Navy land known as the Lamb Mineral interests. Ormat owns these mineral rights.

Approximately 16 miles of the southern gen-tie route in Alternative 1 are located on US Navy land. The US Navy performs a variety of activities in the Dixie Valley, including low-level supersonic flights, long-range navigation training on routes near the project site, combat search and rescue training via helicopter, and other trainings at the Dixie Valley Training Area south of this project site.

Approximately 26.7 miles of the southern gen-tie route would be located within an area that has been segregated from all forms of appropriation under the public land laws, including the mining laws, mineral leasing laws, and geothermal leasing laws, subject to valid existing rights. The BLM has segregated this area in response to an application received from the DON for a withdrawal expansion for military use of the Naval Air Station Fallon, Fallon Range Training Complex in Churchill County, Nevada. The segregation is in effect for a period of 2 years from September 2, 2016, unless the application/proposal is cancelled or approved prior to that date.

3.15.2 Environmental Consequences

Proposed Action (Northern Gen-tie Route)

The US Navy performs training activities that includes operating aircraft under low-level and supersonic conditions in the Dixie Valley region. Potential impacts on US Navy activities in Dixie Valley are reviewed by the Federal Aviation Administration if the impact exceeds or conflicts with flight obstruction specifications found in 14 CFR, Subpart 77.13. The Proposed Action would not exceed or conflict with the flight obstruction specifications.

The Proposed Action would not conflict with existing ROWs or uses granted within them. The BLM would notify all ROW holders in the area of the proposed project and ensure that the proposed project does not negate rights granted to them. Because the project would not impact existing ROWs, exceed or conflict with flight obstruction specifications, or result in degradation of existing roads or access to public and US Navy lands, impacts on land use authorizations are not anticipated.

Alternative 1 (Southern Gen-tie Route)

If the southern gen-tie route is approved by the BLM Authorizing Officer, the BLM would strongly desire concurrence from the Department of the Navy that the land use authorization would not conflict with the segregated lands proposed use. Other impacts would be the same as under the Proposed Action.

No Action Alternative

Under the No Action Alternative, the BLM would not approve the Proposed Action, the facilities would not be constructed, and ORNI 32 would likely suspend exploration activities authorized under the two previous Decision Records for the foreseeable future. As such, there would be no impact on land use authorizations.

3.16 WILDERNESS STUDY AREAS

3.16.1 Affected Environment

The north and northwest boundary of the Combined Dixie Meadows Geothermal Unit area is adjacent to the southern and eastern edge of the 94,607-acre Stillwater Range WSA.

3.16.2 Environmental Consequences

Proposed Action (Northern Gen-tie Route)

ORNI 32 is not proposing any activity within the Stillwater Range WSA. Therefore, direct impacts are not anticipated.

BLM Manual 6330 Management of Wilderness Study Areas requires analysis of impacts from activities outside of WSAs. The Manual also requires mitigation of impacts “to the extent consistent with best management practices and applicable law” (BLM 2012b).

Because of the Proposed Action’s proximity to the WSA boundary, construction and operation activities could impact wilderness characteristics inside the WSA. Lighting, noise, construction of new facilities, and associated transportation and dust could affect solitude and primitive and unconfined recreation inside the WSA. Potential impacts would be mitigated by environmental protection measures described in **Section 2.1.6**. These measures include applying water to reduce dust, reclaiming areas of temporary disturbance, using certified weed-free seed mixes, using specific paint colors to minimize visibility of new facilities, adhering to a 25 mph speed limit, and utilizing noise-minimizing equipment and design. Application of these measures would result in less than significant indirect impacts on the WSA.

Alternative 1 (Southern Gen-tie Route)

Impacts would be the same as under the Proposed Action.

No Action Alternative

Under the No Action Alternative, the BLM would not approve the Proposed Action, the facilities would not be constructed, and ORNI 32 would likely suspend exploration activities authorized under the two previous Decision Records for the foreseeable future. As such, there would be no impact on WSAs.

3.17 PUBLIC HEALTH AND SAFETY AND HAZARDOUS MATERIALS

3.17.1 Affected Environment

Solid waste would include cleared vegetation and other waste materials and debris from construction areas. No hazardous wastes occur in the Project Area, and the proposed project would not generate, use, or dispose of any hazardous waste. Diesel fuel, oil, and lubricants would be used on vehicles traveling on roads in the Project Area. Any wastes that may be generated by the production facilities would be properly disposed through a licensed recycler or disposal company.

Fenced reserve pits would be constructed in accordance with BMPs identified in the BLM Gold Book (BLM 2007a) and NDOW Geothermal Sump Guidelines (NDOW no date) on each pad for the containment and temporary storage of

water, drill cuttings and waste drilling mud during drilling operations. The reserve pit would measure approximately 75 feet by 250 feet by as many as 10 feet deep.

3.17.2 Environmental Consequences

Proposed Action (Northern Gen-tie Route)

Waste materials and debris from construction areas would be collected, hauled away, and disposed of at approved landfill sites. A covered portable dumpster would be kept on site to contain trash.

Constructing reserve pits in accordance with the BLM Gold Book (BLM 2007a) and NDOW Geothermal Sump Guidelines (NDOW no date) would reduce the risk of accidental release of water, drill cuttings and waste drilling mud during drilling operations. Reserve pits would only be used for water, drill cuttings, and waste drill mud; no solid or other waste would be deposited in reserve pits.

Any spill of hazardous waste or hydrocarbons would be remediated by following all local, state, and federal regulations.

Diesel fuel, oil, and lubricants would be used on vehicles traveling on roads in the Project Area. Gas and/or diesel may be stored in the Project Area in a tank with secondary containment that reduces the potential for spills. Therefore, neither short- or long-term impacts from solid or hazardous waste from the proposed project are expected.

Alternative 1 (Southern Gen-tie Route)

Impacts would be the same as under the Proposed Action.

No Action Alternative

Under the No Action Alternative, the BLM would not approve the Proposed Action, the facilities would not be constructed, and ORNI 32 would likely suspend exploration activities authorized under the two previous Decision Records for the foreseeable future. As such, there would be no impact on public health and safety and hazardous materials.

3.18 SOCIOECONOMICS

3.18.1 Affected Environment

The proposed project as described in the Proposed Action, including the geothermal lease area, power plants, and majority of the gen-tie route, is located primarily in Churchill County, Nevada. A portion of the gen-tie line in the Proposed Action would be located in Pershing County, but no workers are expected to reside in Pershing County. (In Alternative 1, the entire project would be located in Churchill County.)

According to the United States Census, the population of Churchill County in 2014 was estimated at 23,989, with 9,253 households. This is a decrease of 3.6 percent from the 2010 population of 24,877 people. The population of Churchill County comprises 5.1 percent of the Nevada statewide population (US Census 2014a). The county seat and closest city to the Project Area is Fallon, which has a population of 8,349 (US Census 2014b). The city is home to Naval Air Station Fallon and is located approximately 43 miles southwest of the Project Area.

As of August 2015, the unemployment rate in Churchill County was 6.8 percent, which was the same as the Nevada rate of 6.8 percent and higher than the United States rate of 5.2 percent (Nevada Workforce Informer 2015). The average annual per capita income in Churchill County is \$24,716, which is less than the state average of \$26,589 (US Census 2014a).

During well drilling and construction of the power plants, substation, and gen-tie, a temporary workforce of up to approximately 75 workers would utilize services in and likely commute from their homes in Churchill County.

3.18.2 Environmental Consequences

Proposed Action (Northern Gen-tie Route)

Construction and operation would result in short-term increases in employment in Churchill County. Because of the relatively small number of employees needed for construction and operation, there would be a negligible change in county-wide unemployment and per capita income. Most employees are anticipated to be local residents and therefore there is no anticipated impact on housing in Churchill County.

Construction and operation of the proposed facilities would generate additional tax revenue from three sources: sales taxes would be collected on indirect spending for construction materials and induced spending from workers buying items; increased property taxes would be collected because of the change in value of the property where facilities would be located; and mineral royalties would be collected as the geothermal resource is utilized. All of these revenue streams would benefit the county by increasing the amount of tax collected.

The northern portion of the gen-tie would be located in Pershing County. It is anticipated that there would be no impacts on socioeconomics in Pershing County because no workers are expected to reside in Pershing County and no taxes or royalties would be collected in Pershing County.

Alternative 1 (Southern Gen-tie Route)

The project footprint and geographic scope of impacts would be entirely contained in Churchill County. Impacts would be the same as those described under the Proposed Action.

No Action Alternative

Under the No Action Alternative, the BLM would not approve the Proposed Action, the facilities would not be constructed, and ORNI 32 would likely suspend exploration activities authorized under the two previous Decision Records for the foreseeable future. As such, there would be no short- or long-term employment, sales taxes, property taxes, or mineral royalties generated by the proposed project.

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CHAPTER 4

CUMULATIVE IMPACTS

Cumulative Impacts are defined by the Council on Environmental Quality in 40 CFR 1508.7 as “impacts on the environment which result from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions.” Cumulative impacts can result from individually minor but collectively significant actions taking place over time. The analysis area for the cumulative impact analysis is the same as the analysis area for each resource found in **Chapter 3**, Affected Environment and Environmental Consequences.

4.1 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

Past actions considered are those whose impacts on one or more of the affected resources have persisted to present day. Present actions are those occurring at the time of this evaluation and during implementation of the Proposed Action. Reasonably foreseeable future actions constitute those actions that are known or could reasonably be anticipated to occur within the analysis area for each resource, within a time frame appropriate to the expected impacts from the Proposed Action. For the Proposed Action, the time frame for potential future action is assumed to be the duration of the lease, or approximately 40 years. The primary past, present, and reasonably foreseeable future actions that would contribute to cumulative impacts of the Proposed Action include continued use of existing unpaved roads, continued exploration and development of geothermal resources within leased areas, continued use of existing land use authorizations, livestock grazing and ranching, dispersed recreation, and military training activities. Specific past, present, and reasonably foreseeable actions include the following:

The TGP Geothermal Exploration EA and Dixie Meadows Geothermal Exploration EA were approved in June 2010 and January 2012, respectively. Combined, the two EAs analyzed and permitted up to 34 well pads (with

multiple wells on each pad), 205.6 acres of surface disturbance on BLM-administered lands, and 4 acres of surface disturbance on the US Navy's Lamb Mineral Interests. Two groundwater wells were also approved. To date, seven wells (three full-size and four core holes) have been drilled.

TGP operates the 230-kV Oxbow transmission line that extends to the south from the Dixie Valley power plant and through the Dixie Meadows Project Area. Under Alternative I, the proposed Dixie Meadows 230-kV gen-tie would parallel the Oxbow line for a majority of its route.

Dixie Valley Road provides access to US Navy facilities, other geothermal development facilities, backcountry recreation areas, and ranching and grazing lands.

Portions of four livestock grazing allotments overlap the Project Area: the Boyer Ranch Cottonwood Valley, Dixie Valley, Jersey Valley, and South Buffalo allotments. Navy training activities, including Night Vision Device aircraft operations, long range navigation training, combat search and rescue training via helicopter, and other training activities, occur at the Dixie Valley Training Area south of the Proposed Action Project Area.

An area of the southern portion of the Dixie Valley has been segregated from all forms of appropriation under the public land laws, including the mining laws, mineral leasing laws, and geothermal leasing laws, subject to valid existing rights, for a period of 2 years from September 2, 2016. It is reasonably foreseeable that the DON would obtain approval from Congress to withdraw this area for the next 20 to 30 years for use by the DON for testing and training involving air-to-ground weapons delivery, tactical maneuvering, use of electromagnetic spectrum, land warfare maneuver, and air support, as well as other defense-related purposes consistent with these purposes (81 FR 58919).

4.2 AIR QUALITY

Past, present, and reasonably foreseeable future actions have impacted and would continue to impact air quality in the cumulative impact analysis area. Construction for geothermal energy development and various administrative rights-of-way for roads and overhead transmission lines and development of minerals material sites have caused adverse impacts on air quality from an increased potential for fugitive dust.

Implementation of the Proposed Action or Alternative I, in combination with other actions in the Dixie Valley, would have cumulative adverse impacts on air quality because of an increased potential for fugitive dust. The potential for these impacts would be highest during construction when ground-disturbing actions are occurring. ORNI 32 would apply dust control measures, as discussed in **Section 3.2.2**. The assumption is that other projects or actions occurring on BLM-administered lands would be subject to similar requirements. As a result, cumulative impacts on air quality would be minimized.

4.3 WATER RESOURCES

Past, present, and reasonably foreseeable future actions that have impacted and would continue to impact water resources include exploration and development of geothermal resources, livestock grazing, and recreation. Geothermal development can result in changes to water quality, quantity, and/or temperature. For example, exploration wells and groundwater wells could alter the structure and/or amount of groundwater resources. Livestock tend to congregate where surface water is present due to availability of water and forage late into the season, potentially contributing to declines in water quality. These areas are also popular for dispersed recreation; vehicles, hikers, and equestrian use can also contribute to water quality impacts.

Implementation of the Proposed Action or Alternative I, in combination with past, present, and reasonably foreseeable actions in the Dixie Valley, has the potential to cumulatively affect water quality, quantity, and/or temperature. Environmental protection measures and mitigation measures would likely be required for any action on BLM-administered lands that has the potential to impact water resources. Groundwater wells would be subject to water law and rights as administered by the NDWR. These measures would ensure water use occurs in an orderly fashion with respect to ground and surface water resources and water rights. In addition, incorporation of the Aquatic Resources Monitoring and Mitigation Plan outlined in **Section 2.1.6** would further aid in reducing cumulative impacts. As a result, cumulative impacts on water resources would be minimized.

4.4 SOIL RESOURCES

Past, present, and reasonably foreseeable future actions have impacted and would continue to impact soil resources in the cumulative impact analysis area. Construction for geothermal energy development and various administrative rights-of-way for roads and overhead transmission lines and development of minerals material sites have caused adverse impacts such as increased potential for wind- or water-driven soil erosion during high wind or precipitation events.

Ground-disturbing activities associated with the Proposed Action and Alternative I, in combination with similar actions elsewhere in the Dixie Valley, would result in cumulative impacts on soil resources. These impacts would include increased potential for wind- or water-driven soil erosion during high wind or precipitation events. Implementation of environmental protection measures in **Section 2.1.6** would reduce these impacts by minimizing disturbance and requiring timely reclamation of temporarily disturbed areas. While soil erosion measures would be in place, localized soil erosion can be expected, given the amount of proposed disturbance, typically dry soil conditions, and occurrence of high winds and infrequent but strong precipitation events in the Dixie Valley. When combined with other reasonably foreseeable future actions, the Proposed Action would result in an incremental addition to soil resource-related impacts. It is assumed that other developments on BLM-

administered land in the Dixie Valley would adhere to similar requirements, thus minimizing cumulative impacts on soil resources.

4.5 VEGETATION

Past, present, and reasonably foreseeable future actions have impacted and would continue to impact vegetation in the cumulative impact analysis area. Construction of various administrative rights-of-way for roads and overhead transmission lines, minerals material sites, and monitoring wells have also impacted vegetation. Impacts include the removal or alteration of the native vegetation cover during construction and to a lesser extent during maintenance of these facilities.

Based on the analysis of direct and indirect impacts, the Proposed Action would disturb up to 1,982 acres of vegetation, 1,860 acres of which would be reclaimed following construction. Approximately 122 acres of vegetation would not be reclaimed following construction. Disturbed areas are primarily associated with temporary work areas for the gen-tie line. These work areas would utilize previously disturbed areas (such as the existing road that parallels much of the proposed gen-tie alignment) when feasible to reduce vegetation impacts. Incorporating additional environmental protection measures would further reduce vegetation impacts. These include minimizing vegetation removal to the extent feasible during construction, interim reclamation following construction, and final reclamation following site decommissioning. Reclamation would be conducted to the standards in the BLM's 2008 geothermal leasing PEIS.

Combined with the past, present, and reasonably foreseeable future actions, the proposed project would only have a minor cumulative contribution to vegetation impacts.

4.6 MIGRATORY BIRDS, WILDLIFE AND KEY HABITAT, AND BLM SENSITIVE SPECIES

Past, present, and reasonably foreseeable future actions have impacted and would continue to have impacts on migratory birds, wildlife, and BLM sensitive species. These resources could be adversely affected by displacement or disruption of normal behavioral patterns. In particular, construction, and project operations and maintenance for geothermal energy development may have the greatest potential to adversely affect wildlife and habitat. Energy development in the region could fragment habitats, decrease aquatic habitat suitability, and disrupt wildlife movement corridors. In addition, some of these projects and actions could increase traffic, conflicts with humans, and competition for habitat niches.

Past, present, and reasonably foreseeable future actions have impacted and would continue to impact BLM sensitive wildlife species, including aquatic species like Dixie Valley pyrg and Dixie Valley toad. Past exploration and development of geothermal resources within leased areas, livestock grazing and ranching, and dispersed recreation may have impacted these species through

disturbance and human presence. These actions have also impacted and would continue to impact BLM sensitive avian species and migratory birds by habitat alteration or by removing nesting and/or foraging habitat. Low-flying military aircraft have also likely caused mortality from collisions during routine US Navy training. Overhead transmission lines have provided some nesting and perching habitat for raptor species but simultaneously increased predation of small mammals, reptiles, and ground-nesting bird species.

Past, present, and reasonably foreseeable future actions have impacted and would continue to have impacts on BLM sensitive plant species in the cumulative impacts analysis area. Actions with the greatest potential to impact BLM sensitive plants are those involving surface disturbance, including energy exploration and development. These actions have resulted in removal of BLM sensitive plant individuals and reduced habitat quality, including by facilitating weed establishment and spread.

Based on the analysis of direct and indirect impacts, the Proposed Action would cause a minimal change in noise levels and approximately 122 acres of habitat loss that would not be reclaimed following construction. Permanent impacts would be primarily limited to power plants and substation, wells, construction of the gen-tie alignment, and access roads. Incorporating the BBCS (**Appendix C**), environmental protection measures, and the Aquatic Resources Monitoring and Mitigation plan outlined in **Section 2.1.6** would minimize or avoid impacts on migratory birds, wildlife and key habitat, and BLM sensitive species. This would come about by minimizing ground disturbance, conducting preconstruction surveys, performing interim and final habitat reclamation, implementing seasonal restrictions for sensitive species, implementing water monitoring and mitigation measures, clearing work areas for nesting birds and other sensitive resources prior to construction, implementing required design features for greater sage-grouse, and avoiding BLM sensitive plant species. As such, the proposed project would only have a minor contribution to cumulative impacts on migratory birds, wildlife and key habitat, and BLM sensitive wildlife species within the analysis area, and would not contribute to cumulative impacts on BLM sensitive plant species, when combined with past, present, and reasonably foreseeable future actions.

4.7 INVASIVE, NONNATIVE, AND NOXIOUS WEEDS

Past, present, and reasonably foreseeable future actions that have impacted and would continue to impact invasive, nonnative, and noxious weeds include exploration and development of geothermal resources, existing land use authorizations, and dispersed recreation including use of existing roads. Impacts associated with past and present actions would have included soil disturbance, which would have increased the potential for establishment and spread of invasive species. Use of existing roads and overland recreation increases potential for weed seed dispersal. Where past and present actions have been

subject to reclamation requirements, the potential for invasive plant establishment and spread would be reduced.

Based on the analysis of direct and indirect impacts, the Proposed Action would disturb up to 1,982 acres, 1,860 acres of which would be reclaimed following construction. Disturbed areas are primarily associated with temporary work areas for the gen-tie line. These work areas would utilize previously disturbed areas (such as the existing road that parallels much of the proposed gen-tie alignment) when feasible. The applicant would control noxious weed populations by preparing and implementing an invasive plant management plan, minimizing surface disturbance during construction, and using weed-free seed during restoration of temporarily disturbed areas as summarized in **Section 2.1.6**. Therefore, the Proposed Action would result in few additional impacts from noxious, invasive plant species and there would be little or no incremental increase in cumulative effects from noxious, invasive plant species from the Proposed Action.

4.8 WETLANDS AND RIPARIAN AREAS

Past, present, and reasonably foreseeable future actions that have impacted and would continue to impact wetlands and riparian areas include exploration of geothermal resources, livestock grazing, recreation, and invasive, nonnative, and noxious weed establishment and spread. Geothermal development can result in permitted loss (i.e., fill) of wetlands and riparian areas. Livestock tend to congregate in wetland and riparian areas due to availability of water and forage late into the season, potentially contributing to reduced vegetation cover, weed spread, soil erosion, and water quality impacts. These areas are also popular for dispersed recreation; vehicles, hikers, and equestrian use can also contribute to noxious weed spread in wetland and riparian areas.

Implementation of the Proposed Action or Alternative 1, in combination with past, present, and reasonably foreseeable actions in the Dixie Valley, has the potential to cumulatively affect wetland and riparian areas. For example, depending on the hydraulic connection with the deeper geothermal resource, the volume and temperature of flows into springs and seeps that support wetland areas in the Dixie Valley could be altered by exploration wells and production and injection wells, potentially altering wetland plant species composition, total wetland area, or surface or subsurface water levels in wetlands.

Development of well pads and the gen-tie may result in direct and indirect impacts including wetland and riparian vegetation loss, erosion and sediment transport into wetland areas. Indirect impacts may also include alteration of surface flow leading to loss of wetland and riparian habitat, in addition to erosion and sediment transport. Soil disturbance associated with these activities and the past, present, and reasonably foreseeable future actions described above can contribute to weed spread, potentially into wetland areas.

Implementing the Aquatic Resources Monitoring and Mitigation Plan and environmental protection measures outlined in **Section 2.1.6**, would aid in reducing impacts. Environmental protection measures would be implemented for all authorized actions on BLM-administered lands to avoid or reduce these impacts, and as a result, cumulative impacts on wetland and riparian areas would be minimized.

4.9 VISUAL RESOURCES

Past, present, and reasonably foreseeable future actions that have impacted and would continue to impact visual resources include construction for geothermal energy development and various administrative rights-of-way for roads and overhead transmission lines.

Implementation of the Proposed Action or Alternative I, in combination with any additional reasonably foreseeable geothermal exploration and development facilities, would result in a change to the existing visual landscape through the introduction of geothermal power generation equipment and associated transmission infrastructure. The Proposed Action or Alternative I would alter the visual character of the Project Area, and the cumulative projects considered in this analysis could potentially change the visual character of the area from rural, open space to a more developed feel both at the generating facilities and along transmission line routes. All newly constructed structures would be painted consistent with BLM visual guidelines to blend with the area and minimize visibility and measures summarized in **Section 2.1.6** would further minimize impacts on visual resources. As a result, cumulative impacts on visual resources would be minimized.

4.10 CULTURAL RESOURCES

Adverse effects on the integrity of setting of any subsequently identified National Register listed or eligible sites where integrity of setting is critical to listing or eligibility could occur from the establishment of geothermal development facilities, including well pads, roads, and plants. Construction activities could increase the likelihood of vandalism and illegal collecting/excavation of cultural sites (Eagles et al. 2002). These impacts on cultural resources could be reduced through the Section 106 process of the NHPA. Mitigation measures requiring surveys for cultural resources prior to surface-disturbing activities, as required by the Proposed Action, would reduce the potential impacts on cultural resources, if implemented for the other actions. As a result, cumulative impacts on cultural resources would be minimized.

4.11 NATIVE AMERICAN RELIGIOUS CONCERNS

Over the last 15 to 20 years, the BLM and the tribes have witnessed an increase in the use of BLM-administered lands by various groups, organizations, and individuals. New ways to utilize the public lands are also on the rise. Livestock grazing, pursuit of recreation opportunities, hunting, fishing, oil, gas, geothermal, and mining leasing, exploration and development, along with relatively newer

uses such as OHV use, interpretive trails, and mountain biking, are among many increasing activities within the BLM CCD, Stillwater Field Office administrative boundary.

In addition to all the existing, growing, and developing uses of the public lands, fluid mineral leasing and exploration would continue to contribute to the general decline in sites and associated activities of a cultural, traditional, and spiritual nature. However, these activities occur on a very small percentage of the total land area.

The traditional lands of the Fallon Paiute-Shoshone Tribe encompass the majority of the state of Nevada (including the BLM Stillwater administrative area). It is imperative that BLM and affected tribes remain flexible and open to productive and proactive communication in order to assist each other in making decisions that would significantly reduce or eliminate any adverse impacts on all parties' interests, resources, and/or activities. As a result, cumulative impacts on Native American religious concerns would be minimized.

4.12 TRAVEL MANAGEMENT

The Proposed Action and Alternative I would introduce additional vehicles and traffic, primarily during the 12- to 24-month construction period. Combined with other past, present, and reasonably foreseeable future actions in the analysis area, there could be temporary and intermittent impacts on organized and competitive events. However, given the low level of traffic on area roads, and the fact that the Proposed Action would contribute a small number of vehicles to the area during operation, there would be negligible cumulative impacts on travel management when combined with impacts from past, present, and reasonably foreseeable future actions.

4.13 LAND USE AUTHORIZATIONS

The Proposed Action, Alternative I, and any new ROWs in the Dixie Valley would be required to comply with adopted land use plans and zoning requirements. If Alternative I is approved, the BLM would desire to obtain concurrence from the DON that the land use authorization would not conflict with the segregated lands proposed use. Therefore, these projects would be consistent with the overall land use policies of the BLM and Churchill and Pershing Counties and would not result in any cumulative effects that would be incompatible with existing or long-term land use patterns when combined with impacts from past, present, and reasonably foreseeable future actions.

4.14 WILDERNESS STUDY AREAS

Implementation of the Proposed Action or Alternative I, in combination with other developments and vehicle travel in the Dixie Valley, would result in indirect cumulative impacts on the Stillwater Range WSA. Because these actions would not be noticeable from the mountainous interior of the WSA where solitude and naturalness are most prevalent, impacts would be minor when

combined with impacts from past, present, and reasonably foreseeable future actions.

4.15 PUBLIC HEALTH AND SAFETY AND HAZARDOUS MATERIALS

Past, present, and reasonably foreseeable future actions may result in the accidental release of hazardous or solid wastes in the analysis area. Releases would be treated per local, state, and federal regulations and the use and storage of hazardous materials would follow BMPs. The Proposed Action or Alternative I would not result in short- or long-term impacts from solid or hazardous waste and would not contribute to any cumulative impacts on this resource. Worker training and exclusion fencing would minimize impacts on health and safety at the project site. Adherence to a 25mph speed limit would minimize impacts along Dixie Valley Road in the Project Area. As a result, cumulative impacts would be negligible when combined with impacts from past, present, and reasonably foreseeable future actions.

4.16 SOCIOECONOMICS

The Proposed Action would have a short-term beneficial cumulative effect from the creation of construction jobs during the construction period. Operation of the proposed facilities and any future energy generating facilities in the Dixie Valley would have a minor beneficial cumulative effect through the number of jobs created and the collection of mineral royalties when combined with impacts from past, present, and reasonably foreseeable future actions.

4.17 NO ACTION ALTERNATIVE

Under the No Action Alternative, the project site would not be developed for geothermal resources at this time and would be available for development in the future. There would be no impacts on any of the identified resources or activities from implementation of the No Action Alternative. As such, there would be no contribution to cumulative impacts on any of the identified resources from implementation of the No Action Alternative when combined with impacts from past, present, and reasonably foreseeable future actions.

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CHAPTER 5

CONSULTATION AND COORDINATION

5.1 AGENCIES, GROUPS, AND INDIVIDUALS CONTACTED

The following agencies, groups, and individuals were contacted for the preparation of the EA:

Nevada Department of Wildlife

- Bonnie Weller, GIS Specialist, Biologist III
- Mark Freese, Western Region Supervising Habitat Biologist
- Jenni Jeffers, Western Region Wildlife Biologist

Nevada Natural Heritage Project

- Eric S. Miskow, Biologist III/Data Manager

Native American Consultation

- Fallon Paiute-Shoshone Tribal Council and Cultural Committee

US Fish and Wildlife Service

- Nevada Fish and Wildlife Office
- Northern Nevada Ecological Services Field Office
- Region 8 Migratory Bird Office

US Navy, Naval Air Station Fallon

- Environmental Department

ORNI 32

- Mark Hanneman, Project Manager

Since the Proposed Action is being proposed as an expansion to the original Dixie Meadows exploration plan, and since the location is identical to that of the original project with no additional resource issues identified, consultation and

coordination conducted for the original Dixie Meadows exploration project was incorporated into this EA.

5.2 LIST OF PREPARERS

Table 23
List of Preparers

Name	Project Expertise
BLM Carson City District, Stillwater Field Office	
Angelica Rose	NEPA, Socioeconomics, Land Use Authorizations, Public Health and Safety
Dave Schroeder	Project Lead, Hazardous or Solid Wastes, Public Health and Safety
Dan Westermeyer	Visual Resources, Travel Management
Melanie Hornsby	Visual Resources, Travel Management
Mark Mazza	Invasive, Nonnative Species
Melanie Cota	Migratory Birds, Wildlife and Key Habitat, BLM Sensitive Species, Threatened and Endangered Species
Jason R. Wright	Tribal Consultation, Cultural Resources, Native American Religious Concerns
Michelle Stropky	Hydrologist, Wetlands and Riparian Areas, Air Quality
Ken Depaoli	Geologist
Linda Appel	Vegetation
Melanie Hornsby	Wilderness/Wilderness Study Areas
BLM Humboldt River Field Office	
Keysha Fontaine (Great Basin Institute, Contracted with the BLM)	Wildlife Biologist
EMPSi	
Drew Vankat	Project Manager, NEPA, Travel Management, Cultural Resources, Native American Religious Concerns, Hazardous or Solid Wastes, Land Use Authorizations, Socioeconomics
Kevin Rice	Visual Resources
Jenna Jonker	Geographic Information Systems
Morgan Trieger	Vegetation, Migratory Birds, Wildlife and Key Habitat, BLM Sensitive Species, Invasive, Nonnative Species, Wetlands and Riparian Areas, Visual Resources
Meredith Zaccherio, Morgan Trieger, Daniel Robison	Biological Survey Report

CHAPTER 6

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